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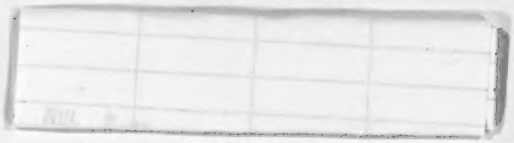
SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 6, NUMBER 8
APRIL 15, 1973

W73-04551 -- W73-05200

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER



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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 8
APRIL 15, 1973

W73-04551 -- W73-05200

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ESTIMATION OF MAXIMUM RUNOFF VOLUMES FOR SMALL PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W73-04805

STREAMFLOW AND WATER-BALANCE INVESTIGATIONS AND COMPUTATIONS (ISSLEDOVANIYE FORMIROVANIYA I RASCHETY STOKA REK I VODNOGO BALANSA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
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WATER RESOURCES AND WATER BALANCE OF SIBERIA (VODNYYE RESURSY I BALANS VOD SIBIRI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
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2B. Precipitation

AMERICAN MYTH: DESERT TO EDEN: THEORIES OF INCREASED RAINFALL AND THE TIMBER CULTURE ACT OF 1873,
Montana Univ., Missoula. Dept. of History.
For primary bibliographic entry see Field 04A.
W73-04599

AMERICAN MYTH: DESERT TO EDEN: CAN FORESTS BRING RAIN TO THE PLAINS,
Colorado Univ., Colorado Springs. Div. of Continuing Education.
For primary bibliographic entry see Field 04A.
W73-04600

KINEMATIC FLOW ON LONG IMPERMEABLE PLANES,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 02E.
W73-04792

A PRECIPITATION ESTIMATION TECHNIQUE FOR DEVELOPING ISOHYETS IN AN ARID AREA USING VEGETATION AND TOPOGRAPHIC PARAMETERS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
S. A. Bamberg, and H. N. Friesen.
Water Resources Bulletin, Vol 8, No 6, p 2208-1119, December 1972. 12 fig, 5 tab, 9 ref, 2 append.

Descriptors: *Precipitation (Atmospheric), *Isohyets, *Arid lands, *Nevada, Rainfall, Estimating, Vegetation effects, Groundwater basins, Topography, Data collections, Statistical methods.
Identifiers: *Hualapai Valley (Nevada).

An isohyet map was developed for the Hualapai Valley, a closed hydrologic basin of about 315 square miles in the northwestern Great Basin in Nevada. In this basin practically no climatic data have been collected, and in the northwest Great Basin there are too few stations for determination of rainfall on a detailed basis. Using a vegetational typing to represent a range in elevation and precipitation, an initial mean annual rainfall was determined for selected points on a grid pattern. This rainfall was then modified by using topographic parameters of slope, orientation, exposure, and rainfall shadow effect. The resulting point determinations of mean annual rainfall were smoothed using a trend surface analysis, and an isohyetal map was drawn from the smoothed points. The technique provides an estimated accuracy of one inch of mean annual precipitation and one mile of resolution on isohyets. (Knapp-USGS)
W73-04796

PRODUCTION OF CARBON MONOXIDE IN RAIN WATER,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 02K.
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RELATIONSHIP BETWEEN ATMOSPHERIC CARBON DIOXIDE AMOUNT AND PROPERTIES OF THE SEA,
Texas A and M Univ., College Station. Dept. of Physics.
For primary bibliographic entry see Field 02K.
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PRESENT ARCTIC GLACIATION,
Defence Research Establishment, Ottawa (Ontario).
For primary bibliographic entry see Field 02C.
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DEVELOPING A STATE WATER PLAN, CLOUDBURST FLOODS IN UTAH, 1939-69,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.
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2C. Snow, Ice, and Frost

ARTIFICIAL RADIOACTIVITY OF SOME HYDROBIONTS OF THE SOUTHERN OCEAN (SCOTIA SEA),
For primary bibliographic entry see Field 05C.
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LIFE CYCLE AND SEASONAL ABUNDANCE OF THE COPEPOD LIMNOCALANUS MACRURUS SARS IN A HIGH ARCTIC LAKE,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
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DATA ON THE COMPOSITION AND DARK SURVIVAL OF FOUR SEA-ICE MICROALGAE,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 05B.
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STABILITY OF ELEMENTAL PHOSPHORUS IN EDIBLE MUSCLE TISSUE OF COD DURING PROCESSING INCLUDING ICING, FREEZING AND THAWING, FROZEN STORAGE, SALTING, AND COOKING,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05B.
W73-04730

THE INCLINATION OF TALUS, ARCTIC TALUS TERRACES, AND OTHER SLOPES COMPOSED OF GRANULAR MATERIALS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W73-04800

A METHODOLOGY FOR ESTIMATING RESERVOIR OPERATION EFFICIENCY BENEFITS FROM SNOWMELT FORECASTING IMPROVEMENTS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 04A.
W73-04803

VARIABILITY OF MAXIMUM WATER CONTENT IN SNOW IN AN INADEQUATE AND VARIABLE MOISTURE ZONE (IZMENCHIVOST' MAKSIMAL'NYKH ZAPASOV VODY V SNEGE V ZONE NEDOSTATOCHNOGO I PEREMENNOGO UVLAZHENIYA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-04815

FROST AND COLD PROTECTION BY SPRINKLERS: A NEW ASSESSMENT,
Rain Bird Sprinkler Mfg. Corp., Glenora, Calif.
For primary bibliographic entry see Field 03F.
W73-04901

PRESENT ARCTIC GLACIATION,
Defence Research Establishment, Ottawa (Ontario).
G. F. Hattersley-Smith.
Available from NTIS, Springfield, Va. 22151 as AD-747 001, Price $3.00 printed copy; 95 cents microfiche. Canada, Defence Research Establishment Ottawa, Technical Note 72-7, March, 1972. 30 p, 6 fig, 1 tab, 117 ref.

Descriptors: *Glaciology, *Glaciers, *Classification, *Artic, *Environmental effects, Climates, Ecosystems, Geomorphology, Mapping, Data collections, Remote sensing, Aerial photography, Methodology, Radioisotopes, Instrumentation, *Reviews.

This review of glacier classifications surveys glacier regimes and discusses the roles of glaciers in terms of their effects on climate ecology, geomorphology, and economics. Recent progress in various aspects of glacier research is discussed. In the last 20 years the outstanding advances in glaciology have been the application of physical theory to the dynamics of glaciers and ice sheets and their response to seasonal and climatic change; a refined scheme of glacier classification; the application of radioisotope analysis to the interpretation of glacier stratigraphy and chronolo-

gy; the use of radio waves for airborne glacier sounding; and the development of deep-drilling equipment and thermal probes. Arctic glaciers, and particularly the Inlandsis of Greenland, provided much of the data on which new concepts were based. The logistic support provided by aircraft and oversnow vehicles and the availability of air photographs for reconnaissance and mapping have allowed planning and execution of field work on a scale and of a quality unconceived thirty years ago. (Woodard-USGS)
W73-05095

SNOWDRIFT CONTROL TECHNIQUES AND PROCEDURES FOR POLAR FACILITIES,
Naval Civil Engineering Lab., Port Hueneme, Calif.
F. W. Brier.
Available from NTIS, Springfield, Va. 22151 as AD-744 237, Price $3.00 printed copy; 95 cents microfiche. Technical Report R-767, June, 1972. 45 p, 35 fig, 2 tab, 10 ref.

Descriptors: *Snowpacks, *Snow removal, *Control, *Model studies, *Polar regions, Camp sites, Protection, Runways, Snow management, Winds, Snowfall, Snow surveys.
Identifiers: Snow traps, Snow fences, Building shapes.

Accumulation of windblown snow causes an assortment of problems at polar facilities. In addition to curtailing personnel and vehicular movement, snowdrift accumulation may damage structures and disrupt aircraft operations. In an effort to develop techniques and procedures for alleviating snowdrift accumulation, scale-model studies on building shapes, orientations, and groupings were conducted in wind ducts, and field studies were conducted on snow collection systems. The scale-model wind duct studies of a camp showed that snowdrift accumulation can be reduced by elevating the camp on a snow platform, orienting the buildings 45 deg to the snow-carrying wind, and placing the structures and utilities to permit easy snow removal. The field studies on snow collection systems on airfields showed that 3- to 4-foot high windrows with a borrow pit on their leeward side are effective in controlling drift on runways when located on the upwind side of the surface to be protected. (Woodard-USGS)
W73-05100

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith, H. G. Halverson, and R. A. Jones.
Available from NTIS, Springfield, Va. 22151 as TID-25987, Price $3.00 printed copy; 95 cents microfiche. Atomic Energy Commission Technical Information Center Report TID-25987, February, 1972. 86 p, 28 fig, 50 ref, 2 append. AEC Contract No AT (49-11)2773.

Descriptors: *Snowpacks, *Water equivalent, *Measurement, *Instrumentation, *Radioisotopes, Analytical techniques, Remote sensing, Iodine radioisotopes, Gamma rays, Telemetry, Computer programs, Snowmelt, Streamflow forecasting, Snow surveys.
Identifiers: *Snow gage.

Since 1909, when the technique of snow surveying to determine water content of the snowpack was developed, many gravimetric methods have been designed and used. At the U.S. Forest Service's Central Sierra Snow Laboratory in California, seven generations of profiling snow gages using radioactive isotopes have been developed and used. The final product is a twin-probe gage with which a snowpack of any depth can be profiled. The photomultiplier pulse generated by each gamma photon reaching the detector crystal is transmitted by a coiled cable to a preamplifier attached to the lift mechanism. The photomultiplier signal is amplified and transmitted 250 feet to the Central Sierra Snow Laboratory building through a buried coaxial cable. Both density and depth of each location are printed on a paper tape. Calibration equations have been solved. The gage can be used for streamflow forecasting from snowmelt and for studies in snow hydrology. Computer programs used to tabulate the snow profiles and produce a graphic representation of the snow density profile are listed, and the major components of the profiling snow gage are described. (Woodard-USGS)
W73-05105

2D. Evaporation and Transpiration

INCREASING WATER SUPPLIES BY SUPPRESSION OF RESERVOIR EVAPORATION,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 03B.
W73-04558

WATER TRANSPIRED BY TREES IS INDICATED BY HEAT PULSE VELOCITY,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. H. Swanson.
Agricultural Meteorology, Vol 10, p 277-281, 1972. 3 fig, 7 ref.

Descriptors: *Transpiration, *Timing, *Heat balance, *Thermal conductivity, *Heat flow, *Time series analysis, *Stochastic processes, Trees, Xylem, Water storage, Moisture stress, Moisture tension, Moisture content, Soil moisture, Moisture uptake, Respiration, Stomata, Water loss, Transpiration control.
Identifiers: Heat pulse velocity.

The heat pulse method offers considerable promise in calculating the amount of water transpired by trees. By this method, the velocity of a heat pulse moving upward in the xylem is measured as an indication of a sap water movement. Daily total transpiration was linearly related to heat pulse velocities measured once each day at mid-day or averaged for 4- to 14-hour periods centered on mid-day. Correlation coefficients were higher than 0.98 in each case. Heat pulse velocities were quite constant throughout the daylight hours as a result of clear skies, and were shown to be a function of transpiration and water storage. Significant HPV's during darkness indicated movement into stem storage rather than vapor loss alone, so that any hour's transpiration value was essentially independent of the comparable hour's velocity reading. (Black-Arizona)
W73-04598

DIGITAL SIMULATION OF UNSATURATED GROUNDWATER FLOW CONSIDERING EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02F.
W73-04639

TEST AND APPLICATION OF A COMPUTER MODEL DESCRIBING UNSATURATED GROUND WATER FLOW IN THE PRESENCE OF EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02F.
W73-04640

SOIL-MOISTURE EFFECTS OF CONVERSION OF SAGEBRUSH COVER TO BUNCHGRASS COVER,
Geological Survey, Lakewood, Colo.
L. M. Shown, G. C. Lusby, and F. A. Branson.
Water Resources Bulletin, Vol 8, No 6, p 1265-1272, December 1972. 3 fig, 1 tab, 8 ref.

Descriptors: *Evapotranspiration, *Grasses, *Sagebrush, *Soil water, *Colorado, *Evapotranspiration control, Soil moisture, Consumptive use, Sediment yield, Runoff, Vegetation effects, Water yield improvement, Water balance.

Precipitation, soil moisture, runoff, and vegetation were measured on two, 5- to 10-acre, big sagebrush watersheds and two, equally small, beardless bluebunch wheatgrass watersheds that were converted from big sagebrush in 1967. The watersheds are located near Wolcott, Colorado, at an elevation of 7,200 feet, and are mantled with 2 to 3 feet of silty clay soils. Annual precipitation was about 13.5 inches; about 9 inches occurred as rain or snow from April through October and about 4.5 inches accumulated as a snowpack from November through March. Evapotranspiration was about 2 inches greater in 1968 and 1 inch greater in 1969 from the sagebrush watersheds than from the grass watersheds. With a mature stand of grass in 1970 and 1971 the difference in evapotranspiration were within the range of differences measured during the 3-year calibration period when all four watersheds were sagebrush. Water use was similar in the top 1 foot of soil but slightly more water was used by the grass in the 1- to 2-foot zone and more water was being used by the sagebrush below 2 feet. Soil-water potential data indicated that only the big sagebrush used a small amount of water from the fractured shale at depths below 40 inches. Sagebrush used more water in August and September than the grass. (Knapp-USGS)
W73-04786

MEASUREMENTS OF NON-POTENTIAL EVAPORATION FROM WHEAT,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Div. of Plant Industry.
O. T. Denmead, and I. C. McIlroy.
Agricultural Meteorology, Vol 7, No 4, p 285-302, 1970. 5 fig, 1 tab, 16 ref.

Descriptors: *Evaporation, Wheat, *Measurement, Lysimeters, Hydrologic cycle.
Identifiers: Non-potential evaporation, Energy balance, Canberra (Australia).

The reliability of the energy balance and lysimetric methods for measuring evaporation has been examined in experiments in a field of wheat. Net radiation, soil heat flux and evaporation, E, were measured, the last by means of a weighing lysimeter. Sensible heat flux, H, was obtained by difference in the energy balance equation, and H and E used to construct an experimental estimate of the Bowen ratio. A total of 210 hourly comparisons were made between lysimeter evaporation and calculated evaporation. Differences between Eb and E were generally with plus or minus 0.1 mm/h. This difference was of the same magnitude as the estimated experimental error, and it is concluded both that Eb was a reliable estimate of E, and that the lysimeter itself was adequately representative of its surroundings. Studies over 4 1/2 years of seasonal changes in evaporation and soil water storage in an agricultural system typical of land-use in the Canberra area are described. (Skogerboe-Colorado)
W73-04909

CONSUMPTIVE USE OF WATER BY ALFALFA IN WESTERN NEBRASKA,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
For primary bibliographic entry see Field 03F.
W73-04925

WATER USE AND SOIL WATER DEPLETION BY DRYLAND WINTER WHEAT AS AFFECTED BY NITROGEN FERTILIZATION,
Agricultural Research Service, Bozeman, Mont.
P. L. Brown.
Agronomy Journal, Vol 63, No 1, p 43-46, 1971. 3 fig, 2 tab, 8 ref.

Descriptors: *Nitrogen, *Fertilization, *Wheat, *Consumptive use, Evapotranspiration, Moisture uptake, Soil moisture, Water utilization.
Identifiers: Winter wheat (Triticum aestivum L. 'Winalta').

Evapotranspiration, daily water use, and soil water depletion by Feekes scale (7) growth stages of N-fertilized winter wheat (Triticum aestivum L. 'Winalta') were measured under dryland field conditions. Fall-applied N (NH_4NO_3) rates were 0, 67, and 268 kg/ha (0, 60, and 240 lb/a). Soil water measurements were made at weekly intervals with a neutron moisture meter. Soil NO_3 (-)N to 183 cm (6 ft) in early spring was 21 kg/ha (19 lb/a). ET for the sprig-summer growth period was 22.1, 27.2, and 31.5 cm (8.7, 10.7, and 12.4 in.) for the respective N treatments. Daily ET reached maximum values at the headed-to-flower stage. Soil water extraction was largely limited to the upper 91 cm (3 ft) with no N. With N, the wheat extracted water to 183 cm. Stored soil water supplied 6.1, 11.2, and 15.5 cm (2.4, 4.4, and 6.1 in.) of water to the wheat grown on the three N treatments. This was 30, 55, and 76% of the plant available water to 183 cm. At maturity, there was 18.0, 13.2, and 9.6 cm (7.1, 5.2, and 3.8 in.) of plant available water remaining in the soil to a depth of 183 cm. Grain yields were 1,610, 3,090, and 3,630 kg/ha (24, 46, and 54 bu/a). In addition to increasing ET, N increased water use efficiency by an average of 56%. (Skogerboe-Colorado)
W73-04929

EFFECT OF VARIOUS SALINITY REGIMES ON GROWTH, LEAF EXPANSION AND TRANSPIRATION RATE OF BEAN PLANTS,
Volcani Inst. of Agricultural Research, Israel, Bet-Dagen (Israel).
For primary bibliographic entry see Field 03C.
W73-04961

THE TRANSPIRATION RATE OF UNHARDENED, HARDENED, AND DEHARDENED SEEDLINGS OF SPRUCE AND PINE,
Lund Univ. (Sweden). Dept. of Plant Physiology.
L. Christersson.
Physiol Plant. Vol 26, No 2, p 258-263. 1972. Illus.
Identifiers: Dehardened seedlings, Drought, Frost, Hardened seedlings, Injuries, Light, Picea abies G, Pine G, Pinus sylvestris G, Rates, *Seedlings, Spring, Spruce G, Stomata, Temperature, *Transpiration, Unhardened seedlings.

Tissue injuries in winter are sometimes interpreted as caused by drought damages. The possibility that the tolerance of conifers of winter and spring conditions is increased through decrease in transpiration rate has been little investigated. The transpiration rate of 3- or 6-mo.-old unhardened, hardened, and dehardened seedlings of Pinus sylvestris L. and Picea abies (L.) Karst. was assessed gravimetrically at 20 C. The transpiration rates of seedlings of spruce and pine which had been hardened for 3 mo. were about 1/2 the rates of dehardened seedlings. Transpiration during a dehardening period increased at different rates in pine and spruce. After a dehardening period of 3-5 days the transpiration rate of spruce rached a maximum, whereas pine reached the maximum transpiration rate after a dehardening period of 10-14 days. Transpiration of seedlings of spruce and pine hardened for 3 mo. showed only a very slight reaction to light and darkness. This indicated that stomata of hardened seedlings remained closed. The results are discussed in connection with frost and drought injuries in pine and spruce dur ing early spring.--Copyright 1972, Biological Abstracts, Inc.
W73-04970

WATER LOSSES DURING SPRINKLING,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-04986

EVAPOTRANSPIRATION AND DRAINAGE FROM THE ROOT ZONE OF IRRIGATED COASTAL BERMUDAGRASS (CYNODON DACTYLON L. PERS.), ON COASTAL PLAINS SOILS,
Agricultural Research Service, Thorsby, Ala. Soil and Water Conservation Research Div.
B. D. Doss, and H. M. Taylor.
Transaction of the ASAE (American Society of Agricultural Engineers), Vol 13, No 4, p 426-429, April, 1970. 5 fig, 4 tab, 10 ref.

Descriptors: *Soil-water-plant relationships, *Evapotranspiration, Water conservation, Consumptive use, Evaporation, Transpiration, *Drainage, Soil physics, Bermudagrass, *Alabama, *Coastal plains.

Water contents as a function of time and depth were measured with a neutron meter on plastic-covered and on bermudagrass-vegetated Lucedale soil. Relations between drainage rates and water contents were developed for eight depth increments of the plastic covered profile. These were used to separate evapotranspiration from deep drainage losses. Evapotranspiration of Coastal bermudagrass at Thorsby, Alabama, was 0.8 cm per day for second day after irrigation and decreased to 0.06 cm per day, 28 days after irrigation. The fraction of evapotranspiration from the upper 15 cm of soil decreased with time, but the fraction was constant or increased in all other horizons. (Skogerboe-Colorado State)
W73-04987

INITIAL OBSERVATIONS ON THE INTRODUCTION OF P. CARIBAEA IN CEYLON AND CERTAIN ROOTING, TRANSPIRATION AND MYCORRHIZAL STUDIES ON SEEDLINGS OF TWO PROVENANCES OF THIS SPECIES UNDER CONTROLLED CONDITIONS,
Forestry Dept., Colombo (Ceylon).
For primary bibliographic entry see Field 02I.
W73-05075

TRANSPIRATION OF TREE SPECIES AND SHRUBS IN OAK FORESTS OF THE SOUTHERN FOREST STEPPE OF THE UKRAINIAN SSR, (IN RUSSIAN),
P. T. Zhurova.
Lesovedenie. 3, p 90-95, 1970, English summary.
Identifiers: Acer-platanoides-D, Caragana-arborescens-D, Forests, Fraxinus-pennsylvanica-D, Hornbeam-D, *Oak-D, Season, Shrubs, Species, Steppe, *Transpiration, Tree, Ukrainian-SSR, USSR.

Transpiration moisture expenditure (TME) was studied in 6 permanent stations in pure and mixed oak stands, which were 30-60 yr old. During the first half of the growing season, when reserves of available moisture in a 1.5 m soil layer are quite adequate, mixed oak-maple and oak-hornbeam stands (with or without shrubs) transpire considerably more intensely than the single-storey pure oak forest. Oak in mixed stands with Acer platanoides, hornbeam, Caragana arborescens expends more moisture on transpiration than in pure group oak plantations, and in mixed stands with Fraxinus pennsylvanica it expends the same amount as in pure oak plantations in group. TME of assoicate species during the first half of the growing season in mixed stands constitutes 37-43%; that of shrubs 3-5% of the total TME of the stands. During the second half of the growing season, with the reduction of available moisture, TME is sharply reduced, and in this case TME in mixed stands was equal to or somewhat lower than in pure oak forests. A sharper reduction of TME by 3.2 and 3.7 times in Sept. by 1 oak tree was recorded in mixed 2 and 3 storey stands.--Copyright 1972, Biological Abstracts, Inc.
W73-05157

CORRELATION BETWEEN CUTICULAR AND STOMATAL TRANSPIRATION IN WOODY AND BUSHY PLANTS, (IN RUSSIAN),
Gosudarstvennyi Pedagogicheskii Institut, Ryazan (USSR).
N. I. Antipov.
Fiziol Rast. Vol 18, No 6, p 1207-1212, 1971, English summary.
Identifiers: Betula-pendula-D, *Bushy plants, Corylus-avellana-D, Cuticule, Frangula-alnus-D, Lonicera-xylosteum-D, Plants, Populus-tremula-D, Quercus-robur-D, Stomata, Tilia-cordata-D, *Transpiration, Viburnum-opulus-D, *Woody plants.

Seasonal dynamics of the cuticular and stomatal transpiration rate were studied in birth (Betual pendula Roth.), oak (Quercus robur L.), linden (Tilia cordata Mill.), aspen (Populus tremula L.) and in undergrowth honeysuckle (Lonicera xylosteum L.), European cranberrybush (Viburnum opulus L.), buckthorn (Frangula alnus Mill.) and filbert (Corylus avellana L.). The stomatal transpiration rate of the trees increased in spring, was maintained at the high level in summer and decreased in Sept.; in the shrubs it was relatively high only at the beginning of May when sun rays could still penetrate under the forest canopy. Cuticular transpiration in the plants under the canopy was more than one-half of the total transpiration while in the trees it was only 25%, especially in summer. The role of leaf illumination in stomatal transpiration is discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05166

ENERGY BUDGET AND DIFFUSION RESISTANCES OF A YOUNG SUNFLOWER CROP (HELIANTHUS ANNUUS L.) (IN GERMAN),
Gheat Rijksuniversiteit (Belgium). Lab. of Plantecology.
I. Impens.
Identifiers: Crops, Diffusion, Diurnal, *Energy budget, Helianthus-Annuus-D, Photosynthesis, Respiration, *Sunflower-D, *Transpiration.

A field plot of sunflowers (leaf area index ± 1.6) was studied during 3 clear days in July. The energy budget method and the Bowen ratio technique were applied. For the daytime period (06.00-20.000 hr), 75% of the net radiation was used for evaporation, 17% for sensible heat flux, 7% for soil heat flux and 1.3% for photochemical energy. From a maximum in the morning, photosynthesis decreased as the day proceeded. The net transfer of CO_2 is upward (respiration) after 17 hr 30. Evapotranspiration is closely related but somewhat out of phase with net radiation. Evapotranspiration exceeded the available radiant energy in the late afternoon and there was a net influx of sensible heat from the atmosphere. Introducing a fictive crop surface (with surface temperature±mean leaf temperature) the surface resistance of the sunflower canopy to diffusion of latent heat, rx, sensible heat rt, and a crop internal (stomatal) resistance could be calculated. The surface diffusive resistances of the crop are composed mainly of the resistance of all the leaves in parallel. These surface resistances of the sunflower canopy show a pronounced diurnal trend: for rt this due to changes in windspeed during the day, and the diurnal variation of rers (±rx - rt) and also of rx is determined by stomatal aperture and can be related to the course of global radiation. During a large part of the day rx plus or minus ± 0.5 sec cm-1 and rt plus or minus ± 0.1 sec cm-1. rx

reached cuticular values, 1-20 sec cm-1, early in the morning and near sundown.—Copyright 1972, Biological Abstracts, Inc.
W73-05182

EFFECT OF FERTILIZER ON PHOTOSYNTHESIS, RADIATION REGIME, AND TRANSPIRATION OF COTTON (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Poehvovedeniya i Agrokhimii.
For primary bibliographic entry see Field 03F.
W73-05197

2E. Streamflow and Runoff

WAVE RESONANCE NEAR SHORES,
Wisconsin Univ., Madison. Water Resources Center.
M. C. Shen.
Available from the National Technical Information Service as PB-214 484, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Technical Report, 1972. 42 p, 4 fig, 22 ref. OWRR A-037-WIS (6), 14-31-0001-3250, 14-31-0001-3550.

Descriptors: *Waves (Water), *Flow, *Approximation method, *Free surfaces, *Mathematical models, *Model studies, *Physical properties, *Frequency, *Wavelengths.

The research reported represents only one phase of a two-year study on water waves in thermally stratified lakes and long rivers. The purpose is to develop a systematic method for calculating the resonance frequencies of water bodies with shorelines as generally encountered in oceanographical or hydraulic problems. The approach is based upon the so-called geometrical optics method, or ray method, originally developed for the study of electromagnetic wave propagation. The application of this method to water waves is of quite recent origin, and, as this research has shown, further developments of this method for surface wave problems are very promising. The ray method for surface waves is described as follows. A propagation velocity, or phase velocity, of waves of a given period is first defined at each point of the equilibrium surface of the water. This velocity is just that which waves of the given period would have in water of uniform depth equal to that at the same point. By using the phase velocity and basic principles in geometrical optics, a group of rays can be defined, along which surface waves are assumed to propagate. The variation of amplitude of these waves along a ray is then determined by means of the principle of conservation of energy. The curves along which the phase of a wave is constant are called wave fronts and orthogonal to the rays. If we follow a closed path formed by a congruence of rays due to the successive reflections from the boundaries of a water body, or the refractions caused by the bottom topography, the total increment of the phase would vanish. This condition then gives rise to a system of equations to determine the resonance frequencies.
W73-04565

THEORY AND EXPERIMENTS IN THE PREDICTION OF SMALL WATERSHED RESPONSE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
E. F. Schulz, and V. Yevjevich.
Available from the National Technical Information Service as PB-214 588, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 42, December 1972. 12 p, 2 fig, 29 ref. OWRR B-064-COLO (7). 14-31-0001-3565.

Descriptors: Hydrographs, Unit hydrographs, *Hydrograph analysis, *Model studies, *Small watersheds, Estimating, *Forecasting, Rainfall-runoff relationships.

Small watershed flood response was investigated in several ways. Flood hydrographs measured on small pristine watersheds were assembled along with causal rainfall and other pertinent data. Unit hydrographs have been derived from selected observed hydrographs. The CSU Experimental Rainfall-Runoff Facility provided data which verified the applicability of Kinematic Wave Theory, Unit Hydrograph Theory, Clark's Time-Area Histogram Method of Computing the Unit Hydrograph. A computer method of deriving the unit hydrograph was developed. In some instances the unit hydrographs derived by this optimum matrix inverse method had oscillations in the recession. A method of filtering these oscillations was developed. (See also W73-04626)
W73-04625

EXPERIMENTS IN SMALL WATERSHED RESPONSE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
E. F. Schulz, and V. Yevjevich.
Available from the National Technical Information Service as PB-214 589, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center Completion Report Series No. 43, December 1972. 16 p, 6 fig, 12 ref. OWRR B-054-COLO (3). 14-31-0001-3264.

Descriptors: *Small watersheds, *Overland flow, *Sediments, Channels, Pollutants, *Model studies, Sheet erosion, Unit hydrographs, Water pollution sources, Water pollution control.
Identifiers: Kinematic wave.

The need for a hydrologic research facility is outlined. Size or scale requirements are given. Some improvements to the operational and experimental procedures of the CSU Experimental Rainfall-Runoff Facility are given. Three classes of experiments deal with hydraulics in the overland flow. The second group of experiments have studied the erosion caused by overland flow. These have contributed model data on the evolution of stream channel systems and on sheet erosion. The third group of experiments have provided some data on the pollution hazards of spent oil shale residues resulting from both rainfall and snowfall. (See also W73-04625)
W73-04626

FREE FALLING PARTICLE IN DENSITY STRATIFIED FLUID,
Puerto Rico Univ., Mayagues. Water Resources Research Inst.
For primary bibliographic entry see Field 02J.
W73-04633

WATER SURFACE PROFILES IN DIVIDED CHANNELS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04738

A NUMERICAL SIMULATION OF THE UNDULAR HYDRAULIC JUMP,
For primary bibliographic entry see Field 08B.
W73-04741

GEOMETRIC PARAMETERS FOR ALLUVIAL RIVERS RELATED TO REGIONAL GEOLOGY,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
T. P. Chang, and G. H. Toebes.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 193-201, 1972 (release date). 3 fig, 17 ref.

Descriptors: *Channel morphology, *Meanders, *Alluvial channels, Glacial drift, Indiana, Geomorphology, Discharge (Water), Stream erosion, Sediment transport, Equilibrium, Mapping, Sediment load, Sedimentology, Statistics.
Identifiers: *Wabash River (Ind), *White River (Ind).

Mean width and mean radius of curvature of two natural meandering rivers, the Wabash River and the White River in Indiana, were measured using long reaches. The average discharge and the local glacial geology were identified as major factors that control the meander planform. For a given average discharge, both the mean width and the mean radius of curvature are larger in the younger glacial region than in the older glacial region. Also the influence of a bedrock region is apparent. For a given glacial region, both width and radius increase with the average discharge. This relationship indicates that geometrical similarity of a meander planform does not exist. The change in equilibrium meander planform due to a geological discontinuity holds clues for long term effects of manmade changes in natural rivers. (Knapp-USGS)
W73-04762

CAUSES OF LOCAL CHANGES OF THE LEVEL OF REGULATED ALLUVIAL RIVER BEDS AND THE ELABORATION OF COUNTER MEASURES BY MEANS OF RIVER SCALE MODEL TESTS (ILLUSTRATED ON THE EXAMPLE OF THE ELBE RIVER),
Forschungsanstalt fuer Schiffahrt, Wasser- und Grundbau, Berlin (West Germany).
For primary bibliographic entry see Field 8B.
W73-04763

BED DEFORMATION DUE TO SILTING OF NON-UNIFORM SEDIMENTS IN BACKWATER AFFECTED RIVERS,
Belgrade Univ. (Yugoslavia).
For primary bibliographic entry see Field 02J.
W73-04766

FACTORS AFFECTING FLOODS FROM WATERSHEDS IN HUMID REGIONS OF NORTHEASTERN OHIO,
Akron Univ., Ohio. Dept. of Civil Engineering.
Y. Bar-Kochba, and A. L. Simon.
Water Resources Bulletin, Vol 8, No 6, p 1235-1245, December 1972. 5 fig, 2 tab, 12 ref.

Descriptors: *Floods, *Ohio, *Rainfall-runoff relationships, Correlation analysis, Small watersheds, Rainfall intensity, Infiltration, Slopes, Water storage, Reservoirs, Flood control, Flood forecasting, Flood frequency, Regression analysis.

Statistical multiple correlation analysis was used to relate floods in northeastern Ohio to hydrologic and basin characteristics. The characteristics of floods from small and large watersheds are so significantly different that the two problems cannot be combined into one solution. The most important hydrologic characteristics in large watersheds were drainage area size and main channel slope. For small watersheds the most important hydrologic characteristics were drainage area size, rainfall intensity, and soil index. Small drainage areas are relatively more affected by storage than large drainage areas. Storage of less than 25 acre-feet per square mile will not have significant effect on the mean annual flood (for drainage area above 70 square miles). (Knapp-USGS)
W73-04790

KINEMATIC FLOW ON LONG IMPERMEABLE PLANES,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
D. E. Overton.
Water Resources Bulletin, Vol 8, No 6, p 1198-1204, December 1972. 3 fig, 4 tab, 12 ref.

Descriptors: *Overland flow, *Hydrograph analysis, *Simulated rainfall, *Hydraulic models, *Waves (Water), Surges, Reynolds number, Unsteady flow, Laminar flow, Turbulent flow, Surface runoff, Rainfall-runoff relationships.
Identifiers: *Kinematic waves.

An analysis of more than 200 overland flow hydrographs generated by simulated rainfall on long impermeable planes showed that kinematic waves prevailed over dynamic waves. Although laminar flow appears to occur at low flows, most flows appear to be either in the transition from the laminar to the turbulent state or in a fully developed turbulent state. Location of the laminar-turbulent transition could not be explained in terms of Reynolds number alone. The transition was significantly affected by rainfall intensity - a factor which rendered quantification of the transition indeterminate. However, the error involved in treating all flows as turbulent would be small with the resulting analysis made conciderably less complex. (Knapp-USGS)
W73-04792

RUNOFF, EROSION, AND SOLUTES IN THE LOWER TRUCKEE RIVER, NEVADA, DURING 1969,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 02J.
W73-04794

AN ANALOG COMPUTER DEMONSTRATION OF DOUBLE-PEAKED INSTANTANEOUS UNIT HYDROGRAPHS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 07C.
W73-04795

PROCESSES OF CHANNEL DEVELOPMENT IN A HIGH-TIDE-RANGE ENVIRONMENT: CAMBRIDGE GULF-ORD RIVER DELTA, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 02L.
W73-04799

RIVERS AND LAKES OF THE SOVIET UNION (REKI I OZERA SOVETSKOGO SOYUZA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07C.
W73-04806

STREAMFLOW AND WATER-BALANCE INVESTIGATIONS AND COMPUTATIONS (ISSLEDOVANIYE FORMIROVANIYA I RASCHETY STOKA REK I VODNOGO BALANSA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, Leningrad, Voskresenskiy, K. P., editor, 1972. 280 p.

Descriptors: *Steamflow, *Runoff, *Discharge (Water), *Water balance, *Water resources, Rivers, River basins, Watersheds (Basins), Orography, Topography, Meteorology, Precipitation (Atmospheric), Evaporation, Geographical regions, Gaging stations, Model studies, Statistical methods, Probability, Variability, Instrumentation.
Identifiers: *USSR, *Siberia, *Soviet Far East.

This collection of 14 papers is devoted to investigations and computations of water resources of rivers in the USSR in general as well as in various lowland and mountain regions. Individual papers deal with techniques of streamflow measurement, methods of correlating components in the water balance of river basins, and statistical and probability analyses of hydrologic data. A review of instruments and equipment used to measure precipitation, evaporation, runoff, snow, soil moisture, groundwater levels, and sediment transport in different part of the world is based on a report presented at the Internation Symposium on Results of Research in Representative and Experimental Basins, held in December 1970 in Wellington, New Zealand. (See W73-04808 thru W73-04815) (Josefson-USGS)
W73-04807

LONG-TERM VARIABILITY OF TOTAL ANNUAL RUNOFF IN THE SOVIET UNION AND ITS INDIVIDUAL REGIONS (MNOGOLETNYAYA IZMENCHIVOST' SUMMARNOGO GODOVOGO STOKA REK SOVETSKOGO SOYUZA I YEGO OTDEL'NYKH RAYONOV),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. P. Voskresenskiy.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 88-102, Leningrad, 1972. 5 tab.

Descriptors: *Runoff, *Runoff coefficient, *Discharge (Water), *Geographical regions, *Variability, Fluctuations, Correlation analysis, Estimating, Probability, Water resources, Surface waters, Rivers, River basins, Drainage area, Water year, Annual.
Identifiers: *USSR.

Estimates of long-term variability of runoff for the USSR on the whole and for various geographical regions were based on a 21-year period of record (1945-65). Total outflow of the country's rivers is 4,714 cu km a year, of which 330 cu km (7%) originates outside the USSR. Average annual flow per sq km is 6.3 liter/sec or 198,000 cu km. Runoff in the European part is 1,002 cu km/year or 5.2 liter/sec/sq km. In northern regions, runoff is 9.8 liter/sec/sq km, while in the south (Black, Caspian, and Azov Sea basins) it is 3.2 liter/sec/sq km. Runoff in the Asiatic part is 3,464 cu km/yr or 6.4 liter/sec/sq km. Variations in runoff for individual years are small and do not exceed 9%-10% of the long-term average. (See also W73-04807) (Josefson-USGS)
W73-04808

WATER RESOURCES AND WATER BALANCE OF SIBERIA (VODNYYE RESURSY I BALANS VOD SIBIRI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. P. Voskresenskiy, and A. P. Bochkov.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 103-114, Leningrad, 1972. 4 tab.

Descriptors: *Water resources, *Water balance, *Rivers, *Flow, Runoff, Runoff coefficient, Discharge (Water), Precipitation (Atmospheric), Evaporation, Surface waters, Lakes, Gaging stations, Water resources development, Water management (Applied), Water supply, Water utilization, Variability, Correlation analysis, Annual.
Identifiers: *USSR, *Siberia, *Hydrologic stations, Gaging-station density.

Annually renewable water resources of Siberian rivers total 1,668 cu km, or about 36% of the entire runoff volume of the USSR. Runoff of the Ob' and Yenisey Rivers is 59% of the runoff of all rivers in Siberia and 22.6% of the total streamflow in the USSR. Average annual streamflow in Siberia is 1,605 cu km or 34% of the country's total volume of flow. Annual inflow from other areas is 83.46 cu km, including 21.96 cu km from Sverdlovsk Oblast, 29.5 cu km from Kazakhstan, 0.93 cu km from Bashkir ASSR, 24.87 cu km from Mongolia, and 6.20 cu km from the Chinese People's Republic. Total annual inflow from Mongolia and China is 31.07 cu km or 1.8% of the total water resources of Siberian rivers. As of January 1, 1968, the total number of streamflow gaging stations in Siberia was 776. Average density of the hydrologic stations is 1 per 8,490 sq km, with higher station densities in the Ob' River basin (1 per 4,100 sq km), Transbaykal (1 per 4,500 sq km), Irkutsk Oblast (1 per 6,980 sq km) and a considerably lower density (1 per 15,800 sq km) in Krasnoyarsk Territory. Planning for water-resources development in Siberia is discussed in terms of watershed management, hydropower, flood control, drainage, irrigation, navigation, and industrial and domestic water supply. (See also W73-4807) (Josefson-USGS)
W73-04809

VARIATIONS IN ANNUAL STREAMFLOW IN EAST SIBERIA AND SOVIET FAR EAST (IZMENCHIVOST' GODOVOGO STOKA REK VOSTOCHNOY SIBIRI I DAL'NEGO VOSTOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Ye. G. Ivanov.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo blansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 133-148, Leningrad, 1972. 8 fig, 1 tab, 6 ref.

Descriptors: *Streamflow, *Runoff, *Annual, *Geographical regions, *Variability, Correlation analysis, Rivers, River basins, Drainage area, Precipitation (Atmospheric), Evaporation, Meteorology, Topography, Elevation, Equations.
Identifiers: *USSR, *East Siberia, *Soviet Far East.

Determination of coefficients of variation of annual streamflow in East Siberia and Soviet Far East was based on hydrometric observations at 463 gaging stations on rivers with drainage areas of 0.019 to 2,430,000 sq km, average elevations of 100 to 1,800 m, and average long-term runoff of 0.65 to 89.3 liter/sec/sq km. Except for Transbaykal, variations in annual steamflow are comparatively small, with the coefficients of variation generally not exceeding 0.5. Variability of runoff is smallest on rivers of the Kamchatka Peninsula and Northern Baykal and Stanovoye Uplands, where the coefficients of variation are 0.08-0.30. The effect of natural conditions on spatial variability of these coefficients is examined, and a working formula is developed to define these coefficients on ungaged rivers of the area. (See also W73-04807) (Josefson-USGS)
W73-04810

POSSIBLE CHANGES IN INFLOW OF SURFACE WATERS TO THE SEA OF AZOV (PRITOK POVERKHNOSTNYKH VOD V AZOVSKOYE MORE I YEGO VOZMOZHNYYE IZMENENIYA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. P. Bochkov, and I. B. Ivanova.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 149-185, Leningrad, 1972. 4 fig, 13 tab, 27 ref, 5 append.

Descriptors: *Surface waters, *Rivers, *Streamflow, *Inflow, *Variability, Discharge (Water), Runoff, Water balance, Precipitation (Atmospher-

ic), Evaporation, Reservoirs, Water utilization, Diversion, Construction, Management, Seasonal, Annual.
Identifiers: *USSR, *Sea of Azov.

Changes in inflow of river waters to the Sea of Azov were investigated in connection with construction of large hydraulic installations in the Don and Kuban' River basins and increased utilization of these waters in industry and agriculture. The Don and Kuban' Rivers contribute 95% of the total inflow to the sea. Average annual flow into the sea is 41.1 cu km, of which 27.9 cu km comes from the Don River, 11.1 cu km from the Kuban' River, and 2.1 cu km from all other rivers. As a result of human use, actual inflow to the sea in 1954-69 was 34.7 cu km, of which 22.7 cu km was flow from the Don River, 10.1 cu km was flow from the Kuban' River, and 1.9 cu km was flow from all other rivers. By the year 2000, reduction of runoff may reach 41%, including a 7.1% (2.9 cu km) decrease in runoff resulting from forest improvements, greater consumptive uses, and increased evaporation from pond and reservoir surfaces. (See also W73-04807) (Josefson-USGS)
W73-04811

USE OF WATER- AND HEAT-BALANCE EQUATIONS TO MEASURE AVERAGE ANNUAL RUNOFF OF UNGAGED MOUNTAIN STREAMS IN THE VITIM RIVER BASIN (RASCHET NORMY GODOVOGO STOKA NEIZUCHENNYKH GORNYKH REK S PRIMENENIYEM URAVENIY VODNOGO I TEPLOVOGO BALANSOV NA PRIMERE REK BASSEYNA R. VITIMA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. S. Vuglinskiy.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 186-207, Leningrad, 1972. 5 fig, 1 tab, 30 ref, 1 append.

Descriptors: *Runoff, *Streamflow, *Water balance, *Heat balance, *Equations, Precipitation (Atmospheric), Evaporation, Radiation, Meteorology, Geomorphology, Topography, Orography, Elevation, Watersheds (Basins), Annual, Maps.
Identifiers: *USSR, *East Siberia, *Vitim River, Heat exchange.

A study was made of the possibility of using precipitation and evaporation computations to determine average annual runoff of ungaged mountain streams in the 225,000-sq-km Vitim River basin in East Siberia. To calculate average annual precipitation for watersheds in the area, precipitation and basin elevation values were plotted on a 1:500,000 scale map. Total evaporation was calculated from the equation developed by Budyko and refined by the author to fit mountain conditions. Calculated values of average annual runoff for 31 watersheds were generally within plus or minus 15% of observed values. (See also W73-04807) (Josefson-USGS)
W73-04812

STREAMFLOW INVESTIGATIONS AND COMPUTATIONS IN THE KOLKHIDA LOWLAND (ISSLEDOVANIYE I RASCHET STOKA REK KOLKHIDSKOY NIZMENNOSTI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
M. A. Mirianashvili.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 208-229, Leningrad, 1972. 7 fig, 4 tab, 15 ref.

Descriptors: *Investigations, *Streamflow, *Runoff, *Precipitation (Atmospheric), *Rainfall-runoff relationships, Runoff coefficient, Antecedent moisture content, Evaporation, Interfluves, Precipitation gages, Equations, Maps, Variability, Correlation analysis, Probability, Seasonal, Annual.
Identifiers: *USSR, *Georgian SSR, *Kolkhida Lowland.

Investigations of rainfall-runoff relationships in the Kolkhida Lowland in the Georgian Republic were based on observations of runoff in 1967-68 in the Tskhenistskali-Khobi interfluve covering an area of 283 sq km. Precipitation in 1967 was 125% and in 1968 98% of the average annual value. A relation of 10-day runoff to both 10-day precipitation and antecedent moisture conditions was established for cold and warm seasons of the year. Seasonal and annual flow volumes in ungaged areas of the lowland were computed on the basis of rainfall data of 15 meteorological stations for the period 1936-68. The working formulas derived and the maps constructed to show average annual runoff and the coefficient of variation of annual flow can be used in designing drainage systems and in conducting other water-management measures in the area. (See also W73-04807) (Josefson-USGS)
W73-04813

REVIEW OF SPECIAL INSTRUMENTS AND EQUIPMENT USED IN WORLD HYDROLOGIC INVESTIGATIONS IN REPRESENTATIVE AND EXPERIMENTAL BASINS (OBZOR SPETSIAL'NYKH PRIBOROV I OBORUDOVANIYA, PRIMENYAYEMYKH V MIROVOY PRAKTIKE DLYA GIDROLOGICHESKIHK ISSLED OVANIY NA REPREZENTATIVNYKH I EKSPERIMENTAL'NYKH BASSEYNAKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. P. Voskresenskiy.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 221-244, Leningrad, 1972.

Descriptors: *Instrumentation, *Equipment, *Analytical techniques, *Measurement, *Basins, Water balance, Hydrologic cycle, Precipitation (Atmospheric), Evaporation, Runoff, Snow cover, Soil moisture, Groundwater, Sedimentation, Foreign research, Foreign countries, United States, Conferences, Reviews.
Identifiers: *USSR, Pluviographs.

A review of new investigation techniques and special instruments and equipment used in hydrologic studies in different parts of the world is based on a report presented at the International Symposium on Results of Research in Representative and Experimental Basins, held in Wellington, New Zealand, December 2-8, 1970. Discussed is a variety of instruments and techniques developed for gathering information on various phases of precipitation, evaporation and runoff in the Soviet Union, United States, Canada, New Zealand, Germany, Japan, India, Italy, Israel, the Netherlands, Norway, and other countries. Also described are methods and instruments used in measurement of snow, soil moisture, groundwater levels, and sediment transport in both the Soviet Union and the United States. (See also W73-04807) (Josefson-USGS)
W73-04814

VARIABILITY OF MAXIMUM WATER CONTENT IN SNOW IN AN INADEQUATE AND VARIABLE MOISTURE ZONE (IZMENCHIVOST' MAKSIMAL'NYKH ZAPASOV VODY V SNEGE V ZONE NEDOSTATOCHNOGO I PEREMENNOGO UVLAZHENIYA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. B. Zavodchikov.
In: Issledovaniye formirovaniya i raschety stoka rek i vodnogo balansa; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 200, p 245-265, Leningrad, 1972. 7 fig, 1 tab, 37 ref, 1 append.

Descriptors: *Snow cover, *Snowpacks, *Water equivalent, *Moisture, *Variability, Watersheds (Basins), Cultivated lands, Ravines, Gullies, Slopes, Grasslands, Forests, Snow surveys, Probability.
Identifiers: *USSR, *European USSR, *Asiatic USSR, Snow courses.

Occurrence of snow cover on basic forms of the relief in steppe and forest-steppe zones of European and Asiatic Russia was investigated for spatial and temporal variability of maximum water content in snow cover on watersheds, fields, and ravines at the Podmoskovnaya, Pridesnyanskaya, Nizhnedevitskaya, and Zapadno-Kazakhstanskaya precipitation-streamflow stations for a 13 to 17-year period through 1968. The coefficients of variation of the water equivalent in snow vary between 0.30 in northern regions to 0.60-0.65 in the south. On plowed fields the coefficients of variation are generally 20%-30% higher than on virgin soils or idle lands. (See also W73-04807) (Josefson-USGS)
W73-04815

THE INFERENCE OF INTAKE AND HYDRAULIC ROUGHNESS PARAMETERS FROM PLOT RUNOFF USING KINEMATIC WAVE THEORY,
Wyoming Univ., Laramie.
R. D. Burman, and R. D. Black.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 4, p 479-481, April 1970. 5 fig, 3 tab, 5 ref.

Descriptors: *Hydrology, *Computer models, *Surface runoff, *Model studies, Watersheds, Mathematical models, *Infiltration.
Identifiers: Intake rate, Hydraulic roughness.

Surface runoff from rainfall is strongly influenced by infiltration and hydraulic roughness. This study attempted to evaluate infiltration and hydraulic roughness on small plots by determining the values necessary to make a mathematical model fit experimental plot data. The model incorporates a finite difference approximation for the kinematic-wave equations. Infiltration in the model is characterized by Horton's equation, and the surface roughness and the unknowns in Horton's equation are derived by parameter optimization. (Skogerboe-Colorado State)
W73-04994

OPERATION OF IRRIGATION SYSTEMS OUTSIDE THE GROWING SEASON,
For primary bibliographic entry see Field 03F.
W73-04998

DEVELOPING A STATE WATER PLAN, CLOUDBURST FLOODS IN UTAH, 1939-69,
Geological Survey, Salt Lake City, Utah.
E. Butler, and R. E. Marsell.
Utah Division of Water Resources Cooperative-Investigations Report No 11, 1972. 103 p, 17 fig, 7 tab, 9 ref.

Descriptors: *Cloudbursts, *Floods, *Flood damage, *Streamflow, *Utah, Precipitation (Atmospheric), Runoff, Peak discharge, Rainfall-runoff relationships, Rain gages, Stream gages, Storms, Erosion, Washouts, Bridge failure, Agriculture, Reviews, Abstracts, Data collections.

Abstract accounts including storm dates, localities affected, streams involved, flood damage, and other pertinent data are presented for 836 cloudburst floods in Utah during 1939-69. The largest number was in 1965, when 88 floods were reported; 63 floods were reported in 1968, and 56 in 1961. The smallest number of floods was 3 in 1944. In 1942, 1948, and 1950, there were 6 floods each year. Cloudburst floods in Utah were experienced in the vicinity of 131 of 228 communities (incorporated communities and those unincorporated places of 1,000 or more population). Floods also

occurred in the vicinity of 63 other inhabited places (1,000 or less population), for a total of 194 places that experienced floods. Twenty were reported to have experienced 10 or more cloudburst floods. Since July 1847, when permanent settlement began, Utah has experienced a total of 1,339 recorded cloudburst floods, of which 408 occurred along the Wasatch Front. Since about 1948 there has been a general upward trend in flood occurrence. Floods were reported in every month except February and March, and nearly 75% of the floods occurred during July and August. (Woodard-USGS)
W73-05102

LONG SHORE CURRENTS AND WAVE STATISTICS IN THE SURF ZONE,
Tetra Tech, Inc., Pasadena, Calif.
J. I. Collins.
Available from NTIS, Springfield, Va. 22151 as AD-744 228, Price $3.00 printed copy; 95 cents microfiche. Technical Report TC-149-2, February, 1972. 46 p, 19 fig, 1 tab, 7 ref, 1 append. ONR-GP N00014-64-C-0107.

Descriptors: *Ocean waves, *Coasts, *Sediment transport, *Water level fluctuations, *Model studies, Mathematical studies, Computer programs, Input-output analysis, Turbulence, Currents (Water), Velocity, Momentum transfer, Stress, Particle size, Beaches, Shallow water, Shoals, Littoral drift, Tides, Oceanography, Marine geology, Forecasting.
Identifiers: Ocean wave characteristics, Random seas.

In the nearshore area waves arriving from offshore continuously bring in momentum, energy, and mass. Since the shoreline provides a fixed boundary the momentum and energy fluxes are dissipated in the surf zone. Most of the energy is converted to turbulence in the breaker zone but enough is left to supply a nearshore current system and move loose bed material. The momentum brought in by the waves will drive the nearshore current system and cause a local setup or setdown of the mean water level. The momentum and continuity equations for a fluid with a free surface were applied to the nearshore zone to predict longshore currents and wave setup or setdown. The approach includes the random characteristics of the waves. The result of the stability investigation shows that the first order longshore current-wave setup system is unstable to disturbances of the edgewave type. The inference follows that a straight beach must be a rarity. The computer program used to compute longshore current and wave setup due to random seas is included. (Woodard-USGS)
W73-05104

ECOLOGY OF A TROUT STREAM IN THE ATLANTIC PYRENEES, THE LISSURAGA: I. CRITICAL STUDY OF THE ENVIRONMENT, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
M. Thibault.
Ann Hydrobiol, Vol 2, No 2, p 209-239. 1971. Illus. English summary.
Identifiers: Alkalinity, Atlantic, *Ecology, Environment, France, Insects, Invertebrates, *Lissuraga (France), Pyrenees, Streams, Temperature, Trout.

An ecological study of the invertebrate fauna was carried out in a trout stream from 1965 to 1969 inclusive. This stream, the Lissuraga, located in southwest of France, runs in the West end of the Pyrenees, near the Atlantic ocean (in latitude 43 degrees 17' North). The Lissuraga is compared to other trout streams in which the invertebrates under study included several orders of insects at least. The Lissuraga has the climate of French Pays Basque. Pluviosity is high with an autumn maximum and mild temperature all year. The physico-chemical characteristics of the stream show periodical fluctuations (water level, flow, current speed, pH, oxygenation, total alkalinity and hardness, conductivity and temperature) which are closely related to climatic fluctuations. Annual variations are low. The Lissuraga water temperature is the only characteristic which seems very different, according to the other streams on which ecological studies were carried out. Variations in measured values of total alkalinity show that this stream can be considered as poor in Ca.--Copyright 1972, Biological Abstracts, Inc.
W73-05116

2F. Groundwater

PROCEEDINGS OF THE NATIONAL GROUND WATER QUALITY SYMPOSIUM.
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W73-04635

DIGITAL SIMULATION OF UNSATURATED GROUNDWATER FLOW CONSIDERING EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
H. E. Dabiri.
Ph.D. Thesis, 1970. 245 p, 41 fig, 14 tab. OWRR B-018-KAN (2). 14-31-0001-3084.

Descriptors: *Base flow, *Evapotranspiration, *Mathematical models, Transpiration, Soil moisture, Groundwater, *Model studies, Water management (Applied), *Kansas.
Identifiers: Ohm's law, Vertical movement.

A mathematical model describing two-phase flow in porous media has been developed. The model is applicable to the problem of one-dimensional, vertical groundwater movement in unsaturated soils, considering evaporation and transpiration (evapotranspiration). The model is a major extension of one presented earlier by the author, which describes unsaturated flow in the absence of evapotranspiration. The second order, non-linear, partial differential equations describing water-air flow through porous media have been extended to include water losses due to unsteady-state evapotranspiration. The basis of the extension is an analogy to Ohm's law. The water transport in the soil atmosphere or the soil-plant-atmosphere system has been considered to take place due to the existence of successively decreasing driving-force potentials from the soil to the atmosphere. The describing differential equations were converted to finite difference form and solved, with the aid of a digital computer, using an iterative implicit procedure. The model includes effective permeabilities of each phase and capillary pressure as funtions of liquid saturation. The effects of gravity and variable rock and fluid properties are included. The calculation method used for evaporation was checked by comparing computed rates with published experimental data. The transpiration rates were compared with those obtained from an analytical model. Also, the applicability of the model was evaluated by comparison of computed results with experimental field data taken by the Geological Survey. Good agreement between calculated results and the experimental data was obtained. (See also W73-04640)
W73-04639

TEST AND APPLICATION OF A COMPUTER MODEL DESCRIBING UNSATURATED GROUND WATER FLOW IN THE PRESENCE OF EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
J. D. Khare.
M Sc Thesis, 1971. 97 p, 25 fig, 4 tab. OWRR B-018-KAN (3). 14-31-0001-3084.

Descriptors: *Base flow, Unsaturated zone, *Evapotranspiration, *Computer models, Soil moisture, Transpiration, *Kansas, *Model studies, Water management (Applied).

Dabiri developed a computer model to describe unsteady state, one dimensional, air-water flow in porous media in the prescence of evaporation and transpiration (evapotranspiration). The model is capable of computing the amounts of evaporation and transpiration from a soil column, as well as the soil moisture content as a function of position in the column, over any desired period of time. The primary aim of this work was to check the validity of the approach used in the model to describe the transpiration process. A simpler analytic model describing transpiration proposed by Cowan was chosen, and a comparison was made between the published results from Cowan's model and those obtained from the present model. To demonstrate the applicability of the model, simulation runs were made to reproduce some field soil moisture log data measured by Prill. These data consisted of measurements of soil moisture versus depth, at different times, at three test sites in Southwestern Kansas. These soil moisture logs were measured between October 1964 and June 1966 at regular intervals of time and include effects of precipitation, evaporation and transpiration. A sensitivity analysis was carried out to study the effects of changing important transpiration input parameters on the overall model behavior. Despite some basic differences in the formulation of the transpiration process in the models, the results obtained from the present model agreed in general with those reported by Cowan. Good agreement was obtained between the soil moisture logs computed from the present model and those reported by Prill. The sensitivity analysis indicated that the resulting overall model behavior due to changes in important transporation input parameters agrees with that reported in the literature for actual soil-plant-atmosphere systems. In order to acquire further confidence in the model, more tests and applications should be made. (See also W73-04639)
W73-04640

PERFORMANCE OF WELL-GROUPS AT CONSTANT DRAWDOWN,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W73-04785

GROUND-SURFACE WATER INTERACTION IN THE LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Thermal and Fluid Sciences Center.
M. A. Collins.
Water Resources Bulletin, Vol 8, No 6, p 1253-1258, December 1972. 4 fig, 1 tab, 20 ref.

Descriptors: *Surface-groundwater relationships, *Hydraulic models, *New York, Water management (Applied), Water balance, Saline water intrusion, Artificial recharge, Hydrogeology, Aquifer characteristics, Base flow, Groundwater movement, Groundwater recharge, Injection wells.
Identifiers: *Long Island (NY).

Steady-state experiments with a viscous analog of the aquifer system in central Long Island, New York, show significant interaction between surface accretion, stream base flow, well recharge, and the degree of salt-water intrusion. Reductions in accretion cause a proportionately larger decrease in stream base flow. The degree of intrusion is related to the distribution of accretion and well recharge between stream base flow and submarine flow to the sea. This interaction poses a conflict between development of the groundwater resource and maintenance of the surface water

resource. Well recharge offers a potential solution to the conflict. (Knapp-USGS)
W73-04788

THE CONCEPT OF SAFE GROUNDWATER YIELD IN COASTAL AQUIFERS,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-04793

ONE-DIMENSIONAL INFILTRATION INTO LAYERED SOILS,
Texas Water Rights Commission. Basin Hydrology Section.
For primary bibliographic entry see Field 02G.
W73-04917

THEORY OF CHEMICAL TRANSPORT WITH SIMULTANEOUS SORPTION IN A WATER SATURATED POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry; and Oregon State Univ., Corvallis. Dept. of Soils.
F. T. Lindstrom, and L. Boersma.
Soil Science, Vol 110, No 1, p 1-7, July 1970. 7 tab, 16 ref.

Descriptors: *Mathematical models, *Porous media, Flow, Flow system, Chemicals, *Saturated flow, *Adsorption.
Identifiers: *Chemical transport.

Three models for a general transport problem of chemical in a water saturated porous medium have been presented. The experimental evidence available seems to indicate that the Freudlich type isotherm is sufficient for most transport-adsorption experiments. It is also possible to adequately describe the sink effect with two other, completely different models. (Skogerboe-Colorado State)
W73-04963

A STUDY OF TWO-DIMENSIONAL INFILTRATION,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 02G.
W73-04978

HYDRAULIC CONDUCTIVITY SAMPLING FOR CONFIDENCE,
Nevada Agricultural Experiment Station, Reno.
A. S. Dylla, and J. C. Guitjens.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 4, p 485-488, April, 1970. 4 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, *Hydraulic conductivity, *Permeability, Darcy's Law, Porous media, Saturated flow, Percolating water, Drainage.
Identifiers: Probability method.

Analyses of hydraulic conductivity measurements in a highly variable soil indicate that hydraulic conductivity sampling should be spatially distributed over the field. A probability method, based on an initial sample, for determining the final sample size required to assure that both the sample mean and the population mean fall within specified confidence length or limits is presented. A nomograph is also presented to facilitate solution of the trial-and-error procedure for determining the required sample size. (Skogerboe-Colorado)
W73-04990

APPRAISAL OF WATER RESOURCES IN THE EAST CENTRAL FLORIDA REGION,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 04B.
W73-05091

GROUND WATER IN THE HALLANDALE AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-05092

WATER QUALITY AND PHYSICAL CHARACTERISTICS OF NEVADA TEST SITE WATER-SUPPLY WELLS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-05093

THE GROUNDWATER ENVIRONMENT.
Geraghty and Miller, Port Washington, N.Y.

Report, January, 1973. 9 p, 2 fig.

Descriptors: *Hydrogeology, *Groundwater resources, *Aquifer characteristics, *Groundwater movement, *Reviews, Hydrology, Geology, Porosity, Permeability, Infiltration, Water yield, Groundwater recharge, Precipitation (Atmospheric).

The environment of groundwater hydrology is described under the following topics: porosity and permeability; the aquifer or groundwater reservoir; storage and perennial yield; infiltration vs. runoff; climatic factors; physiographic factors; mantle-rock factors; and principal types of aquifers (gravel and sand, limestone and other soluble rocks, basalt and other volcanic rocks, sandstone and conglomerate, crystalline and metamorphic rocks, and porous but poorly permeable materials). (Woodard-USGS)
W73-05101

AN INVESTIGATION OF FILTER MEDIA FOR RECHARGE WELLS IN THE GRAND PRAIRIE REGION OF ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-05106

HYDROLOGY OF CHANNEL-FILL DEPOSITS NEAR SALISBURY, MARYLAND AS DETERMINED BY A 30-DAY PUMPING TEST,
Maryland Geological Survey, Annapolis.
For primary bibliographic entry see Field 04B.
W73-05109

EXPLORATION AND MAPPING OF SALISBURY PALEOCHANNEL, WICOMICO COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W73-05110

2G. Water in Soils

SOIL AND WATER MANAGEMENT FOR SALINITY CONTROL,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-04552

GROUNDWATER RECHARGE AS AFFECTED BY SURFACE VEGETATION AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04B.
W73-04555

ADSORPTION OF UREA BY SOME SUDANE SOILS,
Gezira Agricultural Research Station, Wad Medani (Sudan).
M. B. Said.
Plant and Soil, Vol 36, No 1, p 239-242, 1972. 3 tab, 7 ref.

Descriptors: *Adsorption, *Ureas, *Soil chemical properties, *Ammonium compounds, *Hydrolosis, Control, Cation exchange, Clay, Autoclaves.
Identifiers: *Gezira soils, Sudan, Mercuric chloride treatment.

The adsorption of ammonium from ammonium carbonate formed in soil by hydrolysis of urea is recognized. The measurement is reported of direct adsorption of urea in Gezira soil of the Sudan and two methods are compared for controlling hydroloysis, which is requisite for measuring urea adsorption. All examined soils showed some capacity to adsorb urea. Adsorption of urea was related to both the cation exchange capacity and clay content of Gezira soils. Exchange capacity gave higher correlation to adsorption than did clay content. Autoclaving and mercuric chloride treatments controlled hydrolysis, though autoclaving was preferred. Decreasing relative capacity for soils to adsorb urea were Suleimi, Hosh, Loata, Recent alluvium type a, Yambio, Recent alluvium type b. As much as 98 percent of the adsorbed nitrogen as urea was noted for the Suleimi clay, or 377 micrograms urea nitrogen per gram of soil as 386 micrograms total N adsorbed per gram of soil. (Popkin-Arizona)
W73-04590

MOISTURE STORAGE CAPACITIES IN RELATION TO TEXTURAL COMPOSITION OF WESTERN RAJASTHAN SOILS,
Central Arid Zone Research Inst., Jodhpur (India).
A. S. Kolarkar, and N. Singh.
Annal of Arid Zone, Vol 10, No 1, p 29-32, March 1971. 2 fig, 2 tab.

Descriptors: *Soil investigations, *Soil texture, *Soil analysis, *Silts, *Clays, *Storage capacity, *Specific retention, Soil science, Soil surveys, Soil tests, Soil types, Soil physical properties, Sampling, Arid lands, Porosity, Field capacity, Moisture tension.
Identifiers: India, Rajasthan.

In many soils, moisture equivalent and total water holding capacity or sticky point frequently serve as good indices of soil texture or vice-versa. More information is needed on the relationships of soil texture and water storage capacity in arid lands. Results of soil surveys conducted in various parts of western Rajasthan for this purpose are presented. Soils studied were mostly coarse to medium textured and fairly low in organic matter. Samples collected were analyzed for mechanical composition, moisture equivalent and water holding capacity. Significant correlations were found between silt, clay, silt and clay and these two moisture constants. Silt was found to have the greatest effect on both moisture constants, and silt and clay had the least. Clay mineral was dominantly illitic. (Black-Arizona)
W73-04601

INFLUENCE OF MOISTURE REGIME ON GENESIS OF LATERITE SOILS IN SOUTH INDIA: I. MORPHOLOGY AND CHEMISTRY OF THE CELLS,
Indian Agricultural Research Inst., New Delhi.
A. S. Gowaikar, and N. P. Datta.
J Indian Soc Soil Sci. Vol 19, No 3, p 279-291, 1971, Illus.
Identifiers: *Soil moisture, *Laterites, Chemistry, Genesis, *India, Laterization, Moisture, Morphology, Soils.

Effect of water regime, as judged by Ivanov's 'K-index' for climatic zones, under low, high and excessive annual rainfall and also of the high rainfall distributed under different periods, on the genesis of laterite soils developed on acid igneous rocks under different physiographic positions in the tropical area was investigated. Morphological studies, physicochemical characteristics and the chemical composition of 7 soil profile samples indicate that though the degree of laterization is intensified with increase in rainfall, high rainfall distributed over a longer period retards it. Excessive rainfall with high intensity does not enhance laterization under similar duration of rainfall distribution as that of high rainfall group with low intensity. Lower physiographic positions resulted in detrital lateritic soils.—Copyright 1972, Biological Abstracts, Inc.
W73-04605

CRUSTING AND SWELLING EFFECTS ON WATER INFILTRATION INTO SOIL,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
D. L. Nofziger, D. Swartzendruber, and L. R. Ahuja.
Available from the National Technical Information Service as PB-214 541, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No. 28, January 1973. 90 p, 35 fig, 3 tab, 44 ref. OWRR B-014-IND (4).

Descriptors: *Infiltration, *Surface sealing, *Expansive soils, *Gamma rays, *Moisture content, *Soil density, Nuclear moisture meters, Soil water movement, Unsaturated flow, Numerical analysis, Expansive clays, Diffusivity, Moisture tension, Capillary conductivity, Soil physics.
Identifiers: *Soil crusts, *Dual gamma-ray attenuation, *Similarity reduction analysis, Crust resistance, Material coordinate, Soil-water diffusivity, Unsaturated conductivity, Soil-water suction, Richards Equation, Buckingham-Darcy Equation.

One-dimensional, horizontal soil-water absorption through a thin but resistive inlet zone of soil was studied theoretically and experimentally. An exact numerical solution was obtained, and also an approximate solution based on similarity reduction that held with good accuracy for early to intermediate times of flow, for both the numerical-analysis data for Yolo soil and the experimental measurements performed on Salkum silty clay loam. Also, the principle of dual-energy gamma-ray attenuation was successfully developed for measuring both water and soil content is swelling soils. The dual-energy gamma-ray beam was produced by a 280-mc source of 137Cs placed behind a 389-mc source of 241Am, all in lead shields and collimators. Single-detector separation of the count intensities from 137Cs and 241Am was achieved by a straightforward calibration. Measurements were nondestructive, and relatively precise and rapid. For a highly swelling mixture of equal parts bentonite and silt initially dry, the bulk density decreased by half at the column end where water was admitted. The resulting expansion caused a compensating compression in the remaining dry portion of the column. The transient water contents and bulk densities conformed to a definite pattern in keeping with the theory of water flow in swelling porous media. The new method enables far more realistic studies of water movement in soils, since swelling effects can now be handled.
W73-04630

SOIL SURFACE WATER DEPLETION AND LEAF TEMPERATURE,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 03F.
W73-04685

REMOVAL OF METAL IONS BY SOIL,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 05A.
W73-04694

THE OXIDATION OF IRON SULPHIDES IN SOILS IN RELATION TO THE FORMATION OF ACID SULPHATE SOILS, AND OF OCHRE DEPOSITS IN FIELD DRAINS,
Rothamsted Experimental Station, Harpenden (England).
C. Bloomfield.
J Soil Sci. Vol 23, No 1, p 1-16. 1972. Illus.
Identifiers: *Soil chemical properties, *Iron compounds, Acids, Deposits, Drains, Formation, Iron, Ochre, Oxidation, Soils, Sulfates, Thiobacillus ferrooxidans.

Aerating pyritic soils causes acidification and the formation of acid sulfate soils, or cat-clay. The oxidation of pyrite in soils is associated with the deposition in tile deains of a form of ochre quite distinct from that formed by the action of filamentous Fe bacteria. Pyrite-derived ochre results from the action of Thiobacillus ferroxidans, which, below pH 3.5-4.0, catalyzes the oxidation of Fe2+ and pyrite. In soils less acid than pH 4, pyrite oxidizes relatively slowly by chemical reactions to Fe2+ and is there oxidized by T. ferrooxidans and deposited as hydrated ferric oxide. Once the soil becomes acid enough for T. ferrooxidans to multiply, the rate at which pyrite oxidizes increases several-fold, and at pH 3 Fe appears in the drainage water in the ferric form. Liming seems to decrease the rate of oxidation.—Copyright 1972, Biological Abstracts, Inc.
W73-04716

P-N JUNCTIONS INTERCHANGEABLE TEMPERATURE TRANSDUCERS,
Batelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 07B.
W73-04718

SOIL-MOISTURE EFFECTS OF CONVERSION OF SAGEBRUSH COVER TO BUNCHGRASS COVER,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02D.
W73-04786

AN AUTOMATIC, MULTICHAMBER SOIL-WASHING APPARATUS FOR REMOVING FUNGAL SPORES FROM SOIL,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 05G.
W73-04820

AN INEXPENSIVE VERSATILE INCUBATOR FOR SOIL BIOLOGICAL RESEARCH,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 07B.
W73-04822

PRELIMINARY RESEARCH ON THE LIPOLYTIC BACTERIAL PSYCHROPHILES OF SOIL AND WATER, (RECHERCHES PRELIMINAIRES SUR LES BACTERIES LIPOLYTIQUES PSYCHROPHILES DES SOLS ET DES EAUX),
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-04838

CONVERSION OF DETERIORATED METAL CUTTING FLUIDS INTO PROTEIN,
McNeese State Univ., Lake Charles, La. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-04877

EFFECT OF CHEMICAL STRUCTURE ON MICROBIAL DEGRADATION OF METHYL-SUBSTITUTED ALIPHATIC ACIDS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-04884

MERCURY AND OTHER METALS IN URBAN SOILS,
Hope Coll., Holland, Mich. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04885

MOLYBDENUM REQUIREMENT OF CROPS GROWN ON A SANDY CLAY LOAM SOIL IN THE GREENHOUSE,
Department of Agriculture, Charlottetown (Prince Edward Island).
U. C. Gupta.
Soil Science, Vol 110, No 4, p 280-282, October, 1970. 2 tab, 8 ref.

Descriptors: *Soil chemistry, *Molybdenum, *Podzols, Alfalfa, Clovers, Crop production.
Identifiers: *Micronutrients, Brussel sprouts, Red clover, Spinach, Timothy.

Optimum tissue levels of molybdenum were determined in various crops grown on a sandy clay loam soil. Results were: alfalfa, 0.12 to 0.46; red clover, 0.46 to 1.08; timonthy, 0.41 to 0.71; brussel sprouts, 0.11 to 0.22; and spinach, 0.15 to 0.24 ppm. Since little work has been done on the molybdenum content of crops grown on podzol soils, these results should be of great value in choosing soil molybdenum levels to determine tissue levels of molybdenum for optimum growth of crops under field conditions. (Skogerboe-Colorado State)
W73-04889

ALLOCATION OF CATION EXCHANGE CAPACITY TO SOIL FRACTIONS IN SEVEN SURFACE SOILS FROM PANAMA AND THE APPLICATION OF A CATION EXCHANGE FACTOR AS A WEATHERING INDEX,
Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica).
J. A. Martini.
Soil Science, Vol 109, No 5, p 324-331, May, 1970. 1 fig, 6 tab, 19 ref.

Descriptors: *Soil chemistry, *Soil classification, Soil engineering, Soil groups, Soil investigations, Soil management, *Cation exchange, Soil science, Soils.

The cation exchange capacity (CEC) and mineralogy of tropical soils is most variable due to the diversity in ecosystems and soil groups encountered. In some soils the CEC could not be fully accounted for by either allophane, clay minerals or organic matter. It is believed that this is due to higher CEC values obtained at pH 7.0 rather than at the native soil pH (16) and to other analytical errors such as retention of acetate when using the ammonium acetate method. Of particular interest was the relatively high contribution of the silt fraction to the soil cation exchange properties, particularly in the alluvial and lateritic soils. A weathering index or cation exchange factor was obtained by dividing the clay activity (meq./100 g. clay) by the percent clay (per cent of active material). This index was applied to the soil data to place the soils in a certain weathering sequence. (Skogerboe-Colorado State)
W73-04890

FACTORS AFFECTING THE DETERMINATION OF AVAILABLE SOIL NITROGEN BY CHEMICAL METHODS: I. COMPARISON OF EXTRACTABLE WITH MINERALIZED NITROGEN,
Louvain Univ. (Belgium).
L. M. J. Verstraeten, K. Vlassak, and J. Livens.

Soil Science, Vol 110, No 5, p 299-305, November, 1970. 4 fig, 2 tab, 12 ref.

Descriptors: *Soil chemistry, *Nitrogen compounds, Inorganic compounds, Soil gases.
Identifiers: *Soil extract, *Soil fertility.

Several water soluble nitrogen fractions are correlated with the mineralized nitrogen after 32 days of incubation at 30 deg C. Highest correlation was found for cold water extracts. Analysis of the results proves that cultivated and forest soils must be separated prior to calculating regression lines. Sandy soils do not behave the same as loamy or clayey soils. It can be concluded that both vegetation and soil texture exert their influence on the nitrogen index. (Skogerboe-Colorado State)
W73-04891

RELATION OF MOISTURE CONTENT TO FAILURE STRENGTHS OF SEVEN AGRICULTURAL SOILS,
California Univ., Davis.
W. J. Chancellor, and J. A. Vomocil.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 1, p 9-17, January, 1970. 9 fig, 2 tab, 8 ref.

Descriptors: *Soil physics, *Soil strength, *Soil moisture, Soil mechanics, Soil stability, Moisture content.

Failure strengths of agricultural soils at moisture content normal for crop production tend to increase as moisture content decreases. A hypothesis is presented for relating these two characteristics. The hypothesis is one which would allow the prediction of the internal intergranular bonding stress for any moisture content in excess of 15 bars soil moisture suction, provided the moisture content-soil moisture suction relationship is known. The hypothesis is based on a mechanistic model of how moisture is held in the soil, and how it bonds soil particles together. (Skogerboe-Colorado State)
W73-04893

MODEL THEORY FOR PREDICTING PROCESS OF LEACHING,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05B.
W73-04902

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND VII. GROUND WATER AND SOIL SALINITY IN THE KUROW-DUNTROON DISTRICT,
Department of Agriculture, Mosgiel (New Zealand). Invermay Agricultural Research Center.
For primary bibliographic entry see Field 03C.
W73-04908

FURROW IRRIGATION WITH DECREASING INFLOW RATE,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India). Coll. of Agricultural Engineering and Technology.
For primary bibliographic entry see Field 03F.
W73-04911

SUBSURFACE IRRIGATION SYSTEM ANALYSIS AND DESIGN,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W73-04914

WATER STORAGE AND DRAINAGE UNDER A ROW CROP ON A SANDY SOIL,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 04A.
W73-04915

INFLUENCE OF SOIL SALINITY ON PRODUCTION OF DRY MATTER AND UPTAKE AND DISTRIBUTION OF NUTRIENTS IN BARLEY AND CORN: I. BARLEY (HORDEUM VULGARE L.),
Agricultural Experiment Station, Baghdad (Iraq). Dept. of Soils.
For primary bibliographic entry see Field 03C.
W73-04916

ONE-DIMENSIONAL INFILTRATION INTO LAYERED SOILS,
Texas Water Rights Commission. Basin Hydrology Section.
Yu-Si Fok.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No IR2, Proc. Paper 7343, p 121-129, 1970. 1 fig, 2 tab, 2 append, 4 ref.

Descriptors: *Hydrology, *Infiltration, *Permeability, *Soil physics, *Water flow, Irrigation, Porosity.
Identifiers: *One-dimensional infiltration.

An equation in algebraic form has been developed to describe one-dimensional infiltration into layered soils. The effect of soil properties upon the infiltration process is readily observable in this equation. This equation can be reduced to an equation describing infiltration into homogeneous soil by considering profile as being one layer. The validity of this developed equation has been shown by the study of two cases of two-layered soils. Good agreement between published and computed infiltration data is obtained. (Skogerboe-Colorado)
W73-04917

PREDICTING IRRIGATION REQUIREMENTS OF CROPS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-04918

CHARACTERIZING SOIL AERATION UNDER CHANGING SOIL MOISTURE CONDITIONS FOR BEAN GROWTH,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
S. Dasberg, and J. W. Bakker.
Agronomy Journal, Vol 62, No 6, p 689-692, 1970. 4 fig, 2 tab, 16 ref.

Descriptors: *Aeration, *Soil moisture, Beans, Irrigation effects, Root development, Crop production, Air porosity, Oxygen, Diffusion, Oxidation-reduction potential.
Identifiers: Air porosity, Oxygen diffusion rate.

An attempt was made to evaluate different soil aeration indices as related to plant growth during fluctuations in soil moisture content. Beans (Phaseolus vulgaris var. 'Dubbele Witte') were grown in soil at different aeration conditions obtained by changing bulk density (1.30 and 1.38 g as per cu cm), irrigation frequencies (3 to 11 days between irrigations), and O2 concentrations at the soil surface (11% vs 21%). Frequent measurements were taken of O2 and CO2 concentrations of the soil air, oxygen diffusion rate ODR), and redox potential and a continuous record was kept of soil air content by pot weighings. Vegetative growth and dry matter production were affected strongly by bulk density and irrigation frequency (yields ranged 4 to 16 g dry matter per plant). Total root production was hardly influenced, but the depth of root penetration was affected strongly by these aeration treatments. Lowering the O2 concentration at the soil surface from 21% to 11% had no significant effect on plant growth. Comparing the measured aeration indices (O2 concentration, ODR, and air content), the mean daily air content gave the best correlation with plant growth (r ± 0.82). A continuous record of soil air content seems a good index for evaluating aeration under changing soil moisture conditions. (Skogerboe-Colorado)
W73-04921

THE MEASUREMENT AND MECHANISM OF ION DIFFUSION IN SOILS VI. THE EFFECT OF CONCENTRATION AND MOISTURE CONTENT ON THE COUNTER-DIFFUSION OF SOIL PHOSPHATE AGAINST CHLORIDE ION,
School of Agriculture, Aberdeen (Scotland). Dept. of Chemistry and Biochemistry.
L. V. Vaidyanathan, and P. H. Nye.
Journal of Soil Science, Vol 21, No 1, p 15-27, 1970. 3 fig, 4 tab, 14 ref.

Descriptors: *Phosphates, *Diffusion, Soils, Absorption, Ions, *Analytical techniques, Diffusion.
Identifiers: Resin paper, Desorption, Flux, *Ion diffusion.

The observed flux of phosphate to resin paper can be accounted for, not by the phosphate-adsorption properties of soils, but by the phosphate diffusion in the resin-paper and the desorption relationship of the soil corresponding to the depletion of the labile phosphate in a constant indifferent-anion environment. In uptake by plant roots, if and when alterations of this desorption relationship by the roots' presence are unimportant, the supply of phosphate by diffusion in the soil would be determined by the desorption property of the labile phosphate in the presence of an indifferent anion. The resin-paper method does not provide an accurate enough measure of the diffusion coefficient to be of any practical use. For the present it seems best to calculate the diffusion coefficients using the desorption relationship, which is different for each phosphate level in the same soil, with known values of the impedance factor, until more efficient direct methods are evolved. (Skogerboe-Colorado)
W73-04930

EFFECTS OF TEMPERATURE AND FLOODING ON RICE GROWING IN SALINE AND ALKALINE SOIL,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 03C.
W73-04931

COMPONENTS OF PH DEPENDENT CATION EXCHANGE CAPACITY,
Connecticut Agricultural Experiment Station, New Haven.
B. L. Sawhney, C. R. Frink, and D. E. Hill.
Soil Science, Vol 109, No 5, p 272-278, May 1970. 2 fig, 4 tab, 18 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, Organic acids, *Cation exchange, *Hydrogen ion concentration.
Identifiers: *Cation exchange capacity, Natural salts.

The pH dependent cation exchange capacity (CEC) of some acid soils was determined and separated into two different components: weakly dissociated organic acid groups and Al- or Fe-interlayers and coatings. To determine the pH dependent CEC, soils on which natural salt CEC had been determined were treated with NaOAc of pH 8.2, and the CEC redetermined. The difference between the CEC after treatment and the initial CEC gave the pH dependent CEC. (Skogerboe-Colorado State)
W73-04959

MOVEMENT OF SALT AND WATER NEAR CRYSTALLINE SALT IN RELATIVELY DRY SOIL,
Wisconsin Univ., Madison.
D. R. Scotter, and P. A. C. Raats.

Soil Science, Vol 109, No 3, p 170-178, March 1970. 9 fig, 17 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, Saline soils, Soil water, Soil management.
Identifiers: *Salt movement, Salt dissolution.

Columns of soil with a layer of salt at one end were set up. After a period of time they were sectioned and the water and salt content profiles determined. Columns sampled at different times showed both the water and salt content profiles to be functions of the distance from the soil-salt interface divided by the square root of the time the experiment was run. A simple physical-mathematical model was developed that described the water movement to the salt and the dissolution of the salt. (Skogerboe-Colorado State)
W73-04960

A COMPARISON OF METHODS FOR THE DETERMINATION OF SOIL ORGANIC PHOSPHOROUS,
Lincoln Coll. (New Zealand).
J. D. H. Williams, J. K. Syers, T. W. Walker, and R. W. Rex.
Soil Science, Vol 110, No 1, p 13-17, July, 1970. 1 fig, 2 tab, 9 ref.

Descriptors: *Soil chemistry, Organic compounds, *Phosphorus, Analytical techniques, Pollutant identification.
Identifiers: *Determination methods.

Total organic phosphorous contents of thirteen soil and rock materials were determined using four procedures which involve contrasting analytical approaches. The procedures were the Mehta-Anderson, difference, high temperature ignition, and low temperature ashing. Of the four methods investigated, the Mehta-Anderson procedure was the most satisfactory because it gave the most consistent results over the whole range of phosphorous contents. (Skogerboe-Colorado)
W73-04962

NITROGEN FIXATION BY NONSYMBIOTIC MICROORGANISMS IN SOME CALIFORNIA SOILS,
California Univ., Davis.
For primary bibliographic entry see Field 05B.
W73-04967

A MODEL STUDY OF DRAIN ENVELOPES IN A COARSE-SILT BASE MATERIAL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-04969

CONTROL OF SOIL MOISTURE DURING SPRINKLER IRRIGATION,
Utah State Univ., Logan.
For primary bibliographic entry see Field 03F.
W73-04972

CONSERVATION OF SANDY SOILS WITH A SURFACE MULCH,
Agricultural Research Service, Big Spring, Tex.
For primary bibliographic entry see Field 04D.
W73-04974

A STUDY OF TWO-DIMENSIONAL INFILTRATION,
Hawaii Univ., Honolulu.
Y-S Fok.
Transaction of the ASAE (American Society of Agricultural Engineers), Vol 13, No 15, p 676-681, May, 1970. 2 fig, 2 ref.

Descriptors: *Soil water movement, *Infiltration, *Porous media, Permeability, Soil physics, Soil properties.
Identifiers: Two-dimensional infiltration.

Laboratory studies have been made to correlate the observed two-dimensional infiltration with the observed horizontal and vertical soil moisture movements. The exponents of the infiltration equation may be expressed as the sum of the exponents of the horizontal and vertical soil moisture movement equations. The significance of the infiltration geometry has also been studied. The exponent of the infiltration equation varies with the width and depth of the ditch and the ultimate value of the exponent equals the exponent of the vertical downward soil moisture movement equation. (Skogerboe-Colorado State)
W73-04978

WATER REPELLENCE IN SANDY SOILS OF SOUTHWESTERN AUSTRALIA: (1) SOME STUDIES RELATED TO FIELD OCCURRENCE,
F. J. Roberts, and B. A. Carbon.
Aust Commonw Sci Ind Res Organ Field Stn Rec. Vol 10, No 1, p 13-20. 1971. Illus.
Identifiers: *Soil surfaces, *Soil properties, Accumulation, Australia, Coating, Infiltration, Organic materials, Raindrops, Repellence, Sands, Soils, Water storage.

Water repellence occurs in the surface horizons of many acid, coarse-textured soils. In these soils the mineral particles may have skins of organic materials up to 1 micro m thick. Dehydration of these skins during a hot dry summer caused them to become hydrophobic and they did not readily rewet during the subsequent wet winter period. As a consequence, a very uneven pattern of water infiltration and storage occurred in early winter. In the laboratory the organic skins were readily removed by mechanical action when the soils were set but not when dry. Under field conditions such removal took place on the surface veneer of soil owing to raindrop action.--Copyright 1972, Biological Abstracts, Inc.
W73-04981

STRESS DAY INDEX TO CHARACTERIZE EFFECTS OF WATER STRESS ON CROP YIELDS,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 03F.
W73-04984

HYDRAULIC CONDUCTIVITY SAMPLING FOR CONFIDENCE,
Nevada Agricultural Experiment Station, Reno.
For primary bibliographic entry see Field 02F.
W73-04990

A MODIFIED INFLOW-OUTFLOW METHOD OF MEASURING INFILTRATION IN FURROW IRRIGATION,
Soil Conservation Service, Columbia, S.C.
For primary bibliographic entry see Field 03F.
W73-05000

COMPUTER SIMULATION OF TILE SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-05005

FIELD MEASUREMENT OF HYDRAULIC CONDUCTIVITY ABOVE A WATER TABLE WITH AIR-ENTRY PERMEAMETER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
A. S. Y. Aldabagh, and C. E. Beer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 1, p 29-31, January 1971. 3 tab, 12 ref.

Descriptors: *Soil physics, *Hydraulic conductivity, *Darcey's Law, Groundwater movement, Porus media, Permeability, Infiltration, Drainage, Water table.
Identifiers: Air-entry permeameter.

The air-entry permeameter consists of an infiltration cylinder with an air tight lid. A water source and a vacuum gage are connected to the lid. After a wet front has been established, the soil suction is measured. Several pieces of data were obtained and an equation developed from which the hydraulic conductivity can be calculated. The results obtained compared favorably with laboratory data for the same soil. Advantages of the method include: The method is relatively fast, portability of the equipment, hydraulic conductivity is measured in situ, and the presence of a water table is not required. (Skogerboe-Colorado State)
W73-05006

MOVEMENT OF AGRICULTURAL FERTILIZERS AND ORGANIC INSECTICIDES IN SURFACE RUNOFF,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 05B.
W73-05009

SOIL MOISTURE SAMPLING BY THE NEUTRON SCATTER TECHNIQUE,
Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div.
G. J. Blake.
New Zealand Ministry of Works Hydrological Research Progress Report No 8, 1972. 23 p, 19 fig, 3 ref, 2 append.

Descriptors: *Soil moisture meters, *Nuclear moisture meters, Calibrations, Data collections, Instrumentation, On-site tests, On-site data collections.

The neutron scatter technique determines soil moisture by volume. By random sampling of soil moisture within a catchment, the number of sampling points required for various subsurface levels down to parent rock was determined. Comparisons were also made of results from the moisture depth probe, surface probe and the bulk density probe. About six tubes per hectare are required to adequately record changes in soil moisture with a standard error less than 5% of the sample mean. (Knapp-USGS)
W73-05096

THEORY OF WATER MOVEMENT IN SOILS: 6. EFFECT OF WATER DEPTH OVER SOIL,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Soil Science, Vol 113, No 5, p 308-312, May 1972. 3 fig, 4 ref.

Descriptors: *Infiltration, *Mathematical studies, Groundwater movement, Soil water movement, Recharge, Unsaturated flow, Saturated flow, Percolation, Equations, Flooding, Wetting, Absorption.

The effect of water pressure on absorption and infiltration was studied analytically. The result is valid for all times and agrees with Philip's numerical result for short to moderate times. For very long times a nonzero water depth introduces terms that vary logarithmically in time. The effect of water pressure is stronger for a soil that has initially a higher water content. (See also W73-05098 and W73-05099) (Knapp-USGS)
W73-05097

THEORY OF WATER MOVEMENT IN SOILS: 7. MULTIDIMENSIONAL CAVITIES UNDER PRESSURE,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.

Soil Science, Vol 113, No 6, p 379-382, June, 1972. 1 fig, 11 ref.

Descriptors: *Infiltration, *Mathematical studies, *Recharge wells, Groundwater movement, Soil water movement, Recharge, Unsaturated flow, Saturated flow, Percolation, Equations, Wetting, Absorption.
Identifiers: Infiltration from cavities.

Injection of water from pressurized cavities is treated analytically. The case of a circular cylinder and of a sphere are treated explicityly. A cylinder is the preferred shape to inject the maximum water in the minimum time. For sufficiently high water pressure and as long as the saturation front is not too far from the source, both gravity and the diffusivity of the material have little influence on the absorption of water. (See also W73-05097 and W73-05099) (Knapp-USGS)
W73-05098

THEORY OF WATER MOVEMENT IN SOILS: 9. THE DYNAMICS OF CAPILLARY RISE,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange, and D. Aylor.
Soil Science, Vol 114, No 2, p 79-81, August 1972. 2 fig, 3 ref.

Descriptors: *Capillary action, *Soil water movement, *Mathematical studies, Porous media, Wetting, Saturated flow, Unsaturated flow, Diffusivity, Unsteady flow, Equations.

A simple analytical representation for the one-dimensional capillary rise of water in porous media is derived. For the case of Yolo clay, the analytical solution and Philip's numerical solution are in complete agreement for times up to 1 million sec, which is the limit of validity for Philip's time series expansion. However, Philip's solution describes only the early stages of the capillary rise, typically less than 10% of the complete rise, while the present technique describes the whole phenomenon. (See also W73-05097 and W73-05098) (Knapp-USGS)
W73-05099

THERMODYNAMICS OF SOIL WATER: 2. THE INTERNAL ENERGY AND ENTROPY OF SOIL WATER,
National Inst. for Agricultural Science, Tokyo (Japan).
S. Iwata.
Soil Science, Vol 113, No 5, p 313-316, May, 1972.

Descriptors: *Thermodynamics, *Soil water, *Soil moisture, Entropy, Free energy, Pore water, Aqueous solutions, Chemical potential, Capillary action, Soil water movement, Ion exchange, Adsorption.

Water in soil should be dealt with as a heterogeneous system. Internal energy and entropy of water in soil are discussed as a function of other variables. The physical significance of thermodynamic quantities that are calculated from adsorption isotherms or integral heat of immersion is explained. (Knapp-USGS)
W73-05108

CORRELATIONS BETWEEN GRASSLAND VEGETATION AND SITE WITH SPECIAL REGARD TO THE WATER BALANCE, (IN GERMAN),
E. M. Wiedenroth.
Arch Naturschutz Landschaftsforsch, Vol 11, No 1/2, p 71-97. 1971. Illus. English summary.
Identifiers: *Soil water, Calcium, Carbonate, *Grasslands, Soil moisture, Pores, Sites, Soils, Vegetation, Water balance, Hydrogen ion concentration.

The water regime of soils (groundwater, soil moisture, air volume, not available water) is emphasized, but kinds of soil, contents of humus and CaCO3, pH, and pore volumes are also considered. Observations were made in 140 localities with 60 soil ditches and 12 periodically controlled stations. The ecological characteristics of the communities represented in the grassland of the Oder-Bruch are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05125

SOILS IN MARSHES OF THE LOWER COURSE OF THE SAVA RIVER (IN SERBO-CROATIAN),
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
Z. Gligoric.
Arh Poljopr Nauk. Vol 23, No 83, p 126-136. 1970. Map. English summary.
Identifiers: Irrigation, Marshes, Moisture, Morphology, River, *Sava River, *Soils, *Yugoslavia.

The soils comprise an uneven area, the lowest part of the region located 71 m above sea level and the highest part at 74-76 m above sea level. Genesis was caused by floods, groundwaters, and hydrophile vegetation. A greater part of these soils consist of undeveloped alluvium clayey, alluvium loamy, and alluvium loamy on hydromorphic black soil. Fluctuations of the groundwater level are considerable and irregular, 0.5-3 m; groundwater appears even on the surface of low depressions. The soils are mainly moderately humic, calcareous and slightly alkaline. They are used for row crops, and small grains. The meliorative measures would involve control of excessive moisture, and irrigation during the summer months.--Copyright 1972, Biological Abstracts, Inc.
W73-05173

DETERMINATION OF SATURATION COEFFICIENTS IN SANDS (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Institut fuer Wasserbau and Wasserwirtschaft.
R. Mull, G. Battermann, and P. W. Boochs.
Z Pflanzenernahr Bodenkd. Vol 129, No 1, p 9-19. 1971. Illus. English summary.
Identifiers: Capillary, Coefficients, Diffusivity, Flow, *Infiltration, Moisture, *Sands, *Saturation, Spectrophotometry, X-Ray.

By means of capillary tension-saturation curves and horizontal infiltration the moisture diffusivity for the flux of water in soil was determined. To measure the moisture content, the X-ray spectrophotometer was used. In the coarse-grained sand the application of Bruce and Klute's method was limited by gravity. In the middle fine sand region there was good agreement of the diffusivities calculated by the 2 different ways.--Copyright 1972, Biological Abstracts, Inc.
W73-05174

INFLUENCE OF CROPS ON THE WATER STABILITY OF THE SOIL (IN CZECH),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
J. Kosik.
Ved Pr Vysk Ustavu Rastlinnej Vyroby Piestanoch. 9 p 139-146. 1971. English summary.
Identifiers: Barley-M,*Crops, Green, Helianthus-Annuus-D, Lotus-Corniculatus-D, Manure, *Soils, Summer, *Water stability.

The influence of Lotus corniculatus L., Helianthus annuus and 1-yr green manure crops on the water stability of clayey-argillaceous, carbonate soil to a depth of 4 cm was studied. In 4 yr the medium weight average of the aggregates increased under L. corniculatus by 3.7%. Under the green manure crops it increased by 21.4%. Under summer barley with undersown L. corniculatus, water stability was lower than under H. annuus. Under L. corniculatus the main weight average of the aggregates increased during the vegetation period until Sept.; then it decreased under H. annuus.--Copyright 1972, Biological Abstracts, Inc.
W73-05176

2H. Lakes

BEHAVIOR OF WATER IN A SOUTHWESTERN IMPOUNDMENT,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 05B.
W73-04559

WAVE RESONANCE NEAR SHORES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02E.
W73-04565

INVASION AND DISTRIBUTION OF ASIATIC CLAM (CORBICULA MANILENSIS) IN A SOUTHERN CALIFORNIA RESERVOIR,
Union Carbide Corp., Tarrytown, N.Y.
A. Fast.
Bull S Calif Acad Sci. Vol 70, No 2, p 91-98. 1971. Illus.
Identifiers: Asiatic clams, California, *Clams, Corbicula manilensis, *Distribution, Invasion, Reservoirs.

C. manilensis Philippi were probably established in El Capitan Reservoir by 1962. Relatively few live specimens, and no empty shells were observed during 1964. Empty shells were first observed during the summer of 1965 and outnumbered living specimens by 1967. Live clam populations increased from 234 x 10000 individuals during the summer 1964 to a peak of 10,816 x 10000 during Jan. 1966. They declined to 6744 x 10000 during the summer 1967. These fluctuations were partially attributed to water level changes and reservoir stratification. Thermal and chemical stratification limited the depth distribution of Corbicula to the shallow, aerated depths during stratified periods. Their distribution extended to all depths following prolonged periods of artificial destratification. Corbicula densities appeared positively correlated with sediment mean partical size.--Copyright 1972, Biological Abstracts, Inc.
W73-04579

POPULATION DYNAMICS OF POND ZOOPLANKTON, I. DIAPTOMUS PALLIDUS HERRICK,
Kansas Water Resources Research Inst., Manhattan.
K. B. Armitage, B. Saxena, and E. E. Angino.
Contribution No. 92, (1972). 59 p, 10 tab, 1 fig, 83 ref. OWRR A-013-KAN (2). 14-01-0001-786.

Descriptors: *Aquatic populations, *Copepods, Ponds, Zooplankton, *Environmental effects, Control, *Kansas.
Identifiers: *Diaptomus pallidus Herrick.

The simultaneous and lag relationships between 27 environmental variables and seven population components of a perennial calanoid copepod were examined by simple and partial correlations and stepwise regression. The analyses consistently explained more than 70% of the variation of a population component. The multiple correlation coefficient (R) usually was highest in no lag or in 3-week or 4-week lag except for clutch size in which R was highest in 1-week lag. Population control, egg-bearing, and clutch size were affected primarily by environmental components categorized as weather; food apparently was relatively minor in affecting population control or reproduction. (See also W73-04638)
W73-04637

POPULATION DYNAMICS OF POND ZOOPLANKTON, II. DAPHNIA AMBIGUA SCOURFIELD,
Kansas Water Resources Research Inst., Manhattan.
K. B. Armitage, B. Saxena, and E. E. Angino.
Contribution No. 93, (1972). 25 p, 4 tab, 1 fig, 39 ref. OWRR A-013-KAN (3). 14-01-0001-786.

Descriptors: *Aquatic populations, Crustaceans, Ponds, Zooplankton, *Environmental effects, Control, *Kansas.
Identifiers: *Daphnia ambigua Scourfield.

Calcium was the most important of 27 environmental components affecting density of Daphnia ambigua in a pond in Northeastern Kansas for a 50 week period. Simultaneous stepwise regression accounted for more variability in total number/l and in the number of ovigerous females/l than did any of the lag analyses; 1-week lag accounted for the greatest amount of variability in clutch size. Total number and clutch size were little affected by measures of food. (See also W73-04637)
W73-04638

LIFE CYCLE AND SEASONAL ABUNDANCE OF THE COPEPOD LIMNOCALANUS MACRURUS SARS IN A HIGH ARCTIC LAKE,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-04661

SOME ECOLOGICAL NOTES ON BLUE COLOR PHASE OF CRAYFISH, ORCONECTES VIRILIS, IN TWO LAKES,
Ohio State Univ., Columbus. Dept. of Zoology.
W. T. Momot, and J. E. Gall.
Ohio J Sci. Vol 71, No 6, p 363-370. 1971. Illus.
Identifiers: Blue color, *Crayfish, *Crustaceans, Density, Dependence, Ecology, Lakes, Michigan, Minnows, Orconectes virilis, Phase, Traps.

Ecological data on growth, population density and mortality were collected and analyzed for blue color phase variants of the crayfish populations in North Twin and South Twin Lake, Otsego County, Michigan. Crayfish were collected with baited minnow traps, growth was determined by size frequency analysis of the total catch, and mortality analyzed by use of sequential mark and recapture population estimates. The results suggest that growth is density dependent, survival between blue and normally brown color phases is not different and that the percentage of blue color phase variants in these populations does not exceed 1% of the total population. The lack of difference in mortality rates between the olive brown and blue color phases and the lack of blue crayfish in the stomachs of the fish in these lakes does not support the thesis of selective mortality on the conspicuous blue color phase.--Copyright 1972, Biological Abstracts, Inc.
W73-04674

DYNAMICS OF ORGANIC COMPOUNDS OF NITROGEN AND PHOSPHORUS AS AN INDEX OF BIOTIC CYCLE OF SUBSTANCES IN LAKE BAIKAL (IN RUSSIAN),
For primary bibliographic entry see Field 05B.
W73-04677

ACIDIFICATION OF THE LA CLOCHE MOUNTAIN LAKES, ONTARIO, AND RESULTING FISH MORTALITIES,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-04679

VASCULAR FLORA OF OSSIPEE LAKE, NEW HAMPSHIRE AND ITS SHORELINE,
State Coll. at Boston, Mass. Dept. of Biology.
C. B. Hellquist.
Rhodora. Vol 73, No 794, p 249-261. 1971.
Identifiers: Aquatic plant, *Flora, Lakes, New Hampshire, *Ossipee Lake (NH), Shoreline.

The location, area and water resources of Ossipee Lake are explained. The position of collection centers are mentioned and the temperature as well as pH of water are described. The distribution of floating, emergent and submerged plants are given with reference to the various collection stations. About 140 spp. of vascular plants are listed.--Copyright 1972, Biological Abstracts, Inc.
W73-04723

PREDATOR-PREY INTERACTION IN A TROPICAL LACUSTRINE ECOSYSTEM,
Yale Univ., New Haven, Conn. Dept. of Biology.
T. M. Zaret.
Ecology, Vol 53, No 2, p 248-257, 1972, Illus.
Identifiers: *Ceriodaphnia Cornuta, *Predator-prey relationship, Ecosystems, Interactions, Lacustrine, Melaniris chagresi.

Two distinct morphs of the freshwater zooplankter Ceriodaphnia cornuta are distributed heterogeneously within the same tropical lake. One form, having a relatively superior reproductive potential, is the numerically dominant morph in the open-water areas of the lake. The second form is found commonly only in the near-shore areas along with a nearly equal percentage of the first form. The second morph has a large advantage in terms of avoiding predation and its distribution coincides with that of the important lake predator, the planktivorous fish Melaniris chagresi. Complementary field and laboratory studies support the conclusion that the stable polymorphism of C. cornuta, found only in the near-shore waters, is maintained by predation pressure from M. chagresi. The relationship found in this study among predation, competition, and the primary productivity of the ecosystem is discussed in terms of how these factors interact to determine the final species diversity.--Copyright 1972, Biological Abstracts, Inc.
W73-04783

MANGANESE IN LACUSTRINE ECOSYSTEMS: A REVIEW,
State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-04787

WATER POLLUTION AS AFFECTED BY STREET SALTING,
State Univ. of New York, Syracuse. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-04789

RUNOFF, EROSION, AND SOLUTES IN THE LOWER TRUCKEE RIVER, NEVADA, DURING 1969,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 02J.
W73-04794

RIVERS AND LAKES OF THE SOVIET UNION (REKI I OZERA SOVETSKOGO SOYUZA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07C.
W73-04806

RELATIONSHIPS BETWEEN LAKE TROPHIC STATE AND NITROGEN AND PHOSPHORUS LOADING RATES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05C.
W73-04888

DREISSENA POLYMORPHA AS FOOD FOR WATERFOWL AT LAKE CONSTANCE, (IN GERMAN),
H. Jacoby, and H. Leuzinger.
Anz Ornithol Ges Bayern, Vol 11, No 1, p 26-35, 1972. English summary.
Identifiers: Austria, Coot, *Dreissena-Polymorpha, Duck, Food, Germany, Gull, *Lake Constance, Pochard, Swan, Switzerland, *Waterfowl.

Mass occurrence of D. polymorpha in Lake Constance has led to a large increase of wintering waterfowl. Dreissena is not only consumed by diving birds (red-crested pochard, pochard, ferruginous duck, tufted duck, scaup, eider, goldeneye, red-breasted merganser, goosander, coot), but also by other kinds of waterfowl (mute swan, shelduck, gadwall, mallard, moorhen, herring gull, common gull and black-headed gull); to some extent these species (especially common and black-headed gull but also mallard) sponge on coot and other diving birds. These findings, resulting partly from field observations and partly from analyses of the gizzard, supplement the known food-lists of several species already described in literature. Shell-banks up to 3 m under water are completely grazed in the course of the winter. These depths are the preferred diving zones of the 2 main consumers of Dreissena: coot and pochard. Apparently the waterfowl is successful in impeding a further expansion of Dreissena in the shallow water zone.--Copyright 1972, Biological Abstracts, Inc.
W73-05048

A NEW SPECIES OF KUDOA (MYXOSPORIDEA:CHLOROMYXIDAE) FROM THE SPOT, LEIOSTOMUS XANTHURUS LACEPEDE, IN CLEAR LAKE, TEXAS,
Texas Agricultural Experiment Station, College Station. Dept. of Veterinary Parasitology.
For primary bibliographic entry see Field 05C.
W73-05090

ON LIMNOLOGICAL ASSESSMENT OF EUTROPHIC SHALLOW LAKES BY THEIR BIOMASS,
For primary bibliographic entry see Field 05C.
W73-05111

ON THE ROLE OF BACTERIA AND SEDIMENT IN THE MATERIAL BALANCE OF LAKES,
Wasserwirtschaftsdir ektion Mittlere Elbe-Sude-Elde, Magdeburg (East Germany).
For primary bibliographic entry see Field 05C.
W73-05112

NUTRIENT AND OXYGEN RELATIONS OF THE LAKES OF EAST BRANDENBURG,
For primary bibliographic entry see Field 05C.
W73-05113

INVESTIGATIONS OF FOOD RELATIONS IN ICHTHYOCENOSIS OF LAKE DAL'NII (KAMCHATKA) BASED ON RUBIDIUM AND CESIUM CONCENTRATIONS IN HYDROBIONTS. (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
Y. P. Kanevskii, and D. G. Fleishman.
Ekologiya, Vol 2, No 3, p 5-8. 1971. Illus.
Identifiers: *Cesium Lake, Dalnii, *Food chains, Gasterosteus aculeatus, Hydrobionts, Ichthyocenosis, Kamchatka, Lakes, Lymnaea ovata, Oncorhynchus kisutch, Oncorhynchus nerka, Plankton, Planorbis sp, Punguitius punguitius, Relations, *Rubidium, Salvelinus malma, USSR.

The Rb and Cs concentrations were measured in the hydrobionts Oncorhynchus nerka, O. kisutch, Salvelinus malma, Gasterosteus aculeatus, Punguitius punguitius, Lymnaea ovata and Planorbis

sp of Lake Dal'nii. The ratios of the average concentrations of these elements, Rb/Cs, in the zooplankton and zoobenthos differ considerably. The value of Rb/Cs in the muscle tissue of the fishes remains the same as in the preceding link of the food chain, which permits using the ratio of average concentrations of Rb and Cs for studying the food relations of the ichthyocoenosis of the lake. The results obtained are in good agreement with the ichthyological data on the feeding of fishes of Lake Dal'nii.--Copyright 1972, Biological Abstracts, Inc.
W73-05114

PRODUCTION AND DESTRUCTION IN TROPHOGENIC LEVEL: STUDIES OF ECOLOGICAL PARAMETERS IN POLYTROPHIC ROTSEE AND MESOTROPHIC HORWER BAY (LAKE OF LUCERNE), (IN GERMAN),
For primary bibliographic entry see Field 05C.
W73-05117

FLORISTIC AND ECOLOGICAL SURVEY OF THE VEGETATION OF THE POULGUIDOU POND, SOUTH FINISTERE (FRANCE),
Rennes Univ. (France). Faculty des Sciences.
D. G. Strullu.
Bot Rhedonica Ser A., 8, p 73-94. 1970. Illus.
Identifiers: Cladium mariscus M, Ecology, Finistere, Flora, France, Littorella D, Ponds, *Poulguidou Pond (France), Schoenus nigricans M, Scirpus maritimus M, Scirpus tabernae montani M, Sphagnum, Survey, *Vegetation.

Analysis of the vegetation bordering the Poulguidou Pond and study of the characteristics of the station allowed tracing of the succession of different plant groupings of the vegetation belt of the pond, the peat bogs, and the heaths. Floristically, several neutrophilous or basophilous species (Scirpus tabernae-montani, S. maritimus, Cladium mariscus, Schoenus nigricans) border acidophilous species of Scirpentum fluitantis, Littrelletum and sphagnum moss-containing peat bogs. Ecologically, the succession and distribution of groups are determined by the intersection of hydrostatic vertical variations and substratum horizontal variations. Due to these characteristics, the Poulguidou Pond is a remarkable link in the floristic and ecological chain uniting the hygrophilous littoral environments with the hygrophilous environments of the interior.--Copyright 1972, Biological Abstracts, Inc.
W73-05124

GROWTH OF SOCKEYE JUVENILES IN LAKE KURIL, (IN RUSSIAN),
M. M. Selifonov.
Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 78, p 33-41. 1970. English summary.
Identifiers: *Growth stages, Juveniles, *Lake Kuril (USSR), Scales, *Sockeye salmon, Water temperature, USSR.

The central platform of the scale in the young is layed at an average body length of 40 mm. During the growth process the brood is divided into quick and slow developing parts. The young with a slower growth rate remain in the lake 1 yr longer until the downstream-migrant stage is reached. The numbers of a given brood as well as neighboring ones reflect on the growth of young in freshwater. Up until 1963 there was a clear inverse relationship between growth of the young and the numbers in neighboring broods. After that it became less sharply defined. There were years of high water temperature in the lake and good growth of small broods. The growth of young in the year of downstream--migration was for the most part associated with water temperature rather than the amount of food.--Copyright 1972, Biological Abstracts, Inc.
W73-05128

APPLICATION OF A MATHEMATICAL MODELLING METHOD TO THE STUDY OF THE ROLE OF PHOTOSYNTHETIC AERATION IN A LAKE, (IN RUSSIAN),
Adademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 05C.
W73-05147

TEST OF EXPERIMENTAL ECOLOGY ON A POOL: THE UTILIZATION OF ENCLOSURES IN NATURAL ENVIRONMENT,
Ecole Nationale Superieure Agronomique de Rennes (France). Laboratoire de Physiologie Vegetale.
For primary bibliographic entry see Field 05C.
W73-05148

CYCLOMORPHOTIC VARIATION OF CERATIUM HIRUNDINELLA IN SHANTY HOLLOW LAKE, WARREN COUNTY, KENTUCKY,
North Carolina State Univ., Raleigh. Dept. of Botany.
D. R. Hill.
Trans Ky Acad Sci. Vol 32, No 3/4, p 77-79, 1971.
Identifiers: Apical horn, *Ceratium hirundinella, Cyclomorphotic variation, Horns, Kentucky, Length, Width, *Shanty Hollow Lake (Kentucky).

Samples were obtained on 4 occasions; for 10 organisms from each sample, overall length, width (at girdle), length of apical horn (apex to girdle), and number of horns were recorded. Statistical analyses showed that a highly significant difference existed in the measurements. Average overall length and number of horns of the May population were not significantly different from those of the June population, whereas the July population had significantly fewer horns and reduced overall cell length. Widths were significantly greater in May than June or July, while length of the apical horn did not change from May to June, but was shorter in July. As water temperature increased, average overall lengths and number of horns decreased. Results are in agreement with reports from the literature.--Copyright 1972, Biological Abstracts, Inc.
W73-05159

CONCERNING THE DYNAMICS OF LAKE VEGETATION, (IN RUMANIAN),
Bucharest Univ. (Rumania). Faculty of Biology.
I. T. Tarnavschi, and G. A. Nedelcu.
Commun Bot. 12, p 289-295. 1971.
Identifiers: Dynamics, Lakes, *Macrophytes, *Romania, *Vegetation, Zones.

Studies done in some aquatic basins of the Romanian plain showed the evolution from a floating, non-rooted vegetation (assoc. Lemnetum minoris, Lemno-Azolletum carolinianae, Spirodeletum polyrrhizae, Spirodelo-Salvinietum, etc.) to a floating, rooted vegetation (assoc. Polygono-Potametum natantis, Nymphoidetum peltatae, Myriophyllo-Nupharetum, Nymphaeetum alboluteae, etc.) then from there to a helophyte association (Scirpo-Phragmitetum, Typhetum angustifoliae, etc.); at the lake edge in the above-water zone, the vegetation grew towards a Cariceae association (Caricetum ripario-acutiformis). This evolution is in correlation with the decrease in the water level. In submerged zones at the lake edge the following associations can be found: Scirpetum tabernaemontani, Bolboschoenetum maritimi, Sparaganio-Glycerietum fluitantis; in drier regions these associations are replaced by other associations: Agrostideto-Heleocharitetum, Ranunculetum repentis, Polygono-Bidentetum, etc.--Copyright 1972, Biological Abstracts, Inc.
W73-05184

2I. Water in Plants

DIFFERENT EFFECTS OF CHLORMEQUAT ON CHLOROPHYLL, PROTEIN AND YIELD IN COTTON GROWN UNDER VARYING WATER REGIMES,
National Research Centre, Cairo (Egypt). Botany Lab.
For primary bibliographic entry see Field 03F.
W73-04581

WATER ABSORPTION BY SEEDS AS AFFECTED BY SOIL TEMPERATURE,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
T. N. Chaudhary, N. T. Singh, and G. Singh.
Plant and Soil, Vol 35, p 189-192, 1971. 2 tab, 3 ref.

Descriptors: *Absorption, *Seeds, *Soil temperature, *Limiting factors, *Permeability, *Soil-water plant relationships, Germination, Soil environment, Moisture availability, Wheat, Corn (Field), Laboratory tests, Agriculture, Air-earth interface, Moisture uptake, Environmental control, Planting management, Microenvironment, Temperature, Hydrodynamics.

Water absorption by seeds is the first event in the process of seed germination. For a seed to absorb water, it must have an adequate supply of water. In agricultural situations with different soil temperatures, even if the supply of water is adequate, water absorption may be influenced by the temperature of the soil. A study was made of water absorption by seeds of wheat and corn over a temperature range of 5 to 35 C spaced at 5C in sandy loam soil with moisture levels of 10 and 15 percent. With increasing temperature, water absorption increased being maximum and most rapid at 35C. The entry of water into the seeds, however, is first determined by the permeability of the seed coat. Any increase in the dimension of the intermicellar spaces due to the increase of temperature might increase the flow of water into the seeds. It seems likely that at 35 C the permeability of seed coats was sufficiently increased allowing relatively rapid absorption due to moisture levels under study was not appreciable. Irrespective of treatments, a rapid initial absorption was followed by a tapering-off period of slow absorption. (Black-Arizona)
W73-04582

WATER UPTAKE AND RADICLE EMERGENCE OF COTTONSEED AS AFFECTED BY SOIL MOISTURE AND TEMPERATURE,
For primary bibliographic entry see Field 03F.
W73-04585

EFFECTS OF TIME OF DAY, MOISTURE STRESS, AND FROSTING ON THE ALKALOID CONTENT OF PHALARIS TUBEROSA,
Commonwealth Scientific and Industrial Research Oranization, Canberra (Australia). Div. of Plant Industry.
J. D. Williams.
Australian Journal of Agricultural Research, Vol 23, No 4, p 611-621, July 1972, 2 fig, 6 tab, 20 ref.

Descriptors: *Alkalinity, *Time, *Moisture stress, *Frosting, *Poisonous plants, Safety, Sheep, Diseases, Plant tissues, Leaves, Grasses, Pastures, Grazing, Drought tolerance, Environmental effects, Toxicity, Nitrogen, Nitrogen compounds, Crop production, Water utilization, Wilting, Plant growth regulators, Forecasting, Farm management.
Identifiers: *Alkaloid content, Neurological disorders, Death, Perennial grasses, Australia.

The Australian cultivar of Phalaris tuberosa L. is a much-valued perennial grass component of im-

proved pastures in southeastern Australia, able to persist under continuous and intense grazing and dry conditions, which may be associated with certain neurological disorders of sheep. Experiments were conducted to determine the effect on the alkaloid content of environmental factors (time of day, moisture stress and frosting) in phalaris herbage. These factors are involved in the appearance of toxicity symptoms in field sheep. Time of day had a slight effect on the level of nitrogen (N), N-dimethylated indolealkylamines in leaf tissue of phalaris plants grown under controlled environmental conditions, and a larger effect on field plants. Alkaloid content was not affected by moderate increases in moisture stress, but severe wilting caused an increase in alkaloid content. Immediate regrowth from previously stressed plants had a higher alkaloid content than regrowth from unstressed plants. Severe moisture stress causes an increase in related, unidentified compounds, Frosting increased alkaloid content more in plants receiving adequate N, and even more in plants grown at a Celsius day/night temperatures of 21/16 compared with plants grown at 15/10. Changes in alkaloid content are discussed in relation to field observations and previous results on the toxicity of the plant pastures to sheep. It is now possible to predict that a pasture will have high alkaloid content under certain environmental conditions. Managerial practices may be implemented to minimize risk of sheep disorders and death. (Popkin-Arizona)
W73-04592

EFFECT OF PLANTING DATE ON WATER--USE AND ITS EFFICIENCY IN DRY LAND GRAIN SORGHUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Field Crops.
For primary bibliographic entry see Field 03F.
W73-04594

AN INTERESTING ASSOCIATION OF RARE AQUATIC PLANTS FROM NEW HAMPSHIRE,
State Coll. at Boston, Mass.
L. C. Colt, Jr., C. B. Hellquist, and W. J. L. Zubrin.
Rhodora, Vol 73, No 794, p 296-299, 1971.
Identifiers: Algae, Angiosperms, *Aquatic plants, Association, *New Hampshire, Plants.

An area near the west edge of the New Hampshire turnpike was examined. The algae and angiosperms observed in this area are described.--Copyright 1972, Biological Abstracts, Inc.
W73-04607

ECOLOGY OF FISHES IN THE AMAZON AND CONGO BASINS,
Harvard Coll., Cambridge, Mass. Museum of Comparative Zoology.
T. R. Roberts.
Bull Mus Comp Zool, Vol 143, No 2, p 117-147, 1972.
Identifiers: *Fish populations, Amazon Basin, Catfish, Characoids, Congo Basin, *Ecology, Fishes, Food, Plankton, Predation.

Some relationships between the great diversity of fishes and physical and biological aspects of the environment in the Amazon and Congo basins are discussed. Aspects of physical environment considered are rainfall regimes; stabilizing influence of forests; seasonal fluctuations in water level; white water, clear water, and black water; relative accessibility of Amazon and Congo basins to marine fishes; tidal conditions in the lower Amazon; shoreline and islands; river anastomoses and connections with adjacent basins; stream captures; unique or peculiar biotypes; causes of massive mortality of fishes. The main adaptive significance of parental care in Amazon and Congo fishes is evidently related to reproduction in deoxygenates waters. The following topics are considered under biological interactions; fishes with brilliant coloration or conspicuous markings; associations of similarly colored species of fishes in mixed schools; fishes of minute size; responses to predation; and partitioning of food resources. Trophic adaptations and feeding habits are discussed. The topics considered are predatory fishes; scale-eating characoids; fin-eating characoids; feeding habits of 'parasitic' trichomycterid catfishes; parallelism in feeding habits of 'weakly electrogenic' fishes in the Amazon and Congo basins; plankton-feeding fishes; deposit feeders; and feeding habits of characins and other fishes in Amazonian rainforest streams.--Copyright 1972, Biological Abstracts, Inc.
W73-04613

RESULTS OF 40 HOURS' CONTINUOUS WATCH AT FIVE WATERPOINTS IN AN AUSTRALIAN DESERT,
Commonwealth Scientific and Industrial Research Organization, Floreat Park (Australia).
S. J. J. F. Davies.
Emu. Vol 72, No 1, p 8-12. 1972. Illus.
Identifiers: *Australian desert, Bowerbird, *Birds, Desert, Emus, Finches, Kangaroo, Parrots, Drinking patterns, Pigeons, Waterpoints.

Continuous observations made over 40 hr at 5 watering points in an arid area of Western Australia showed that 24 species drank, even though the weather was cool. Thirteen of these species visited the water on more than ten occasions. Maximum number of emus, zebra finches and spotted bowerbirds were seen in the middle of the day. Maximum numbers of galahs and common bronzewings drank in the evening, whereas maximum numbers of crested pigeons, Port Lincoln parrots, Mulga parrots and Bourke's parrots drank in the early morning. All these species also drank throughout the day in smaller numbers, but yellow-throated miners only came to the water during the morning. The abundance of each of these 13 spp. was assessed from the maximum number seen at each bore, and the number obtained agreed well with the general observations in the area. The emu and Bourke's parrot were rare at that bore where human activity was greatest, whereas the crested pigeon and zebra finch were most abundant at it. Observations on the drinking pattern of the red kangaroo are included for comparison.--Copyright 1972, Biological Abstracts, Inc.
W73-04699

METABOLISM AND THE ABSORPTION OF WATER BY ROOT HAIRS,
Montreal Univ. (Quebec). Dept. of Biological Sciences.
M. Cailloux.
Can J Bot. Vol 50, No 3, p 557-573. 1972. Illus.
Identifiers: *Absorption, *Plant physiology, Cells, Cytoplasm, Hairs, *Metabolism, Oat-M, Roots.

Direct measurements of water uptake on individual root hairs of intact (oat) roots established new parameters of the absorption of water. They show that the velocity of absorption is not proportional to the water stress. Furthermore, absorption takes place only where the main cytoplasmic mass is located in the cell, while no measurable absorption can be found at regions facing the main vacuole. The effects of CO_2, age, metabolites, and poisons indicate that there is an intimate correlation between the intensity of metabolism and the velocity of absorption of water. On the other hand, excretion is associated with low metabolism. These new aspects show that absorption of water is a complex phenomenon involving metabolism.--Copyright 1972, Biological Abstracts, Inc.
W73-04717

A NOTABLE ICHTHYOLOGICAL FIND IN THE KRUGER NATIONAL PARK,
Kruger National Park, Skukuza (South Africa).
U. De V. Pienaar.
Koedoe. 14. p 29-31. 1971. Illus.
Identifiers: *Acanthopagrus berda, *Africa, Ichthyology, Kruger, National park, Record.

The marine species of the mud bream, Acanthopagrus berda (Forskal), was collected on April 3, 1970, near the confluence of the freshwater river system of the Komati and Crocodile Rivers, Kruger National Park. This is the first record of the tidal species to be found within the freshwater system of the Transvaal, and also the farthest point inland that this species has been collected.--Copyright 1972, Biological Abstracts, Inc.
W73-04720

VASCULAR FLORA OF OSSIPEE LAKE, NEW HAMPSHIRE AND ITS SHORELINE,
State Coll. at Boston, Mass. Dept. of Biology.
For primary bibliographic entry see Field 02H.
W73-04723

GROWTH AND FLOWERING OF DANTHONIA SERICEA POPULATIONS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Botany.
J. Rotsettis, J. A. Quinn, and D. E. Fairbrothers.
Ecology. Vol 53, No 2, p 227-234. 1972. Illus.
Identifiers: Air, Bogs, *Danthonia sericea M, Flowering, Georgia, Glabrous, Growth, *Habitats, Latitude, New Jersey, Photoperiods, Ponds, Populations, Pubescent, Rivers, Sands, Soils, Stimulus, Substrates, Temperature.

Seasonal growth and flowering in relation to environmental stimuli were studied in 20 populations of D. sericea Nutt. ranging from New Jersey to Georgia. Flowering in the natural habitat was correlated ($r \pm 0.988$) with latitude, but New Jersey transplant and greenhouse tests indicated that populations of this species can be separated into 3 groups on the basis of their habitat and flowering response mechanism. Populations with glabrous sheaths from bogs or wet areas next to rivers or ponds in New Jersey required only adequate air and soil temperatures for growth and subsequent flowering. In these wet habitats, substrate temperature apparently serves as the environmental stimulus to which the plants respond. For the populations with pubescent sheaths occurring at openings or fringes of upland pine-oak forests on well-drained, sandy soils and for the glabrous populations occurring along stream borders and drainage areas adjacent to granite outcrops in Georgia, an additional requirement for specific photoperiods apparently exists.--Copyright 1972, Biological Abstracts, Inc.
W73-04882

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM III. OXYGEN CONCENTRATION PROFILES, RESPIRATION RATES, AND THE SIGNIFICANCE OF PLANT AERATION PREDICTED FOR MAIZE ROOTS,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. J. Luxmoore, L. H. Stolzy, and J. Letey.
Agronomy Journal, Vol 62, No 3, p 325-329, 1970. 7 fig, 3 tab, 16 ref.

Descriptors: *Oxygen, *Diffusion, Respiration, Root systems, *Aeration, Plant physiology.
Identifiers: *Maize (Zea mays L.), Maize root model.

Oxygen concentration profiles, mean respiration rates, and the percent plant aeration estimates (proportion of respired oxygen diffusing from the atmosphere via gas spaces in the plant) were obtained from an analysis of steady state oxygen diffusion in maize (Zea mays L.) root models under simulated field conditions. An increase in root radius and in water film thickness as occurs after rainfall or irrigation induced a decrease in oxygen concentration within the root, a decrease in mean respiration rate, and an increase in percent plant

aeration (PPA). An increase in root length reduced both mean respiration rate and PPA. Plant aeration is predicted to be a significant factor in the oxygen relations of maize roots. For a given root system, the gas-filled porosity and the thickness of the water film around the root have the greatest influence on this process. Soil aeration is important in the oxygen supply to the lower root and root tip regions and this has a critical effect on continuing plant growth and development. (Skogerboe-Colorado)
W73-04922

A MODEL OF A GROWING PASTURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Meteorological Physics.
For primary bibliographic entry see Field 04A.
W73-04933

DYNAMIC SIMULATION OF PLANT GROWTH--PART II. INCORPORATION OF ACTUAL DAILY WEATHER AND PARTITIONING OF NET PHOTOSYNTHATE,
Ohio Agricultural Research and Development Center, Wooster.
R. B. Curry, and L. H. Chen.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 6, p 1170-1174, June, 1971. 6 fig, 17 ref.

Descriptors: *Plant growth, *Computer models, *Dynamic programming, Growth rates, Mathematic models, Irrigation effects.

The dynamic simulation model of plant growth has been developed for corn to the point it will simulate reasonably close the growth and development of the corn plant. The simulator will respond to variable weather data. Moisture stress was shown to have an effect on simulated growth. The concept of competition was demonstrated. The model can be used to test various plant growth parameters both physiological and environmental to determine which ones might be key factors in increasing efficiency of production. These then could be studied in a growth chamber or in the field. The modifications suggested by simulation might be ones that needs genetic research or ones that would respond to a change in environmental management. (Skogerboe-Colorado State)
W73-04988

AQUATIC AND WETLAND PLANTS OF SOUTHWESTERN UNITED STATES,
Southern Methodist Univ., Dallas, Tex.
D. S. Correll, and H. B. Correll.
Available from the National Technical Information Service as PB-214 811, also available from GPO, Washington, D.C. 20402 as EP1.16:16030 DNL 01/72, Price $7.75. Environmental Protection Agency Water Pollution Control Research Series 16030 DNL 01/72, January 1972. 1777 p, 789 fig, 51 ref.

Descriptors: *Aquatic plants, *Wetlands, *Southwest U.S., *Water pollution effects, *Plant growth, Water properties, Water quality, Environmental effects, Ecosystems, Root systems, Root zone, Plant physiology, Plant morphology, Soil-water-plant relationships, Seasonal, Marshes, Bogs, Plant populations, Vegetation, Plant groupings, Ferns, Flowering, Reviews.

The primary aim of this detailed work is to enable one to identify ferns and flowering plants that grow naturally in polluted and unpolluted aquatic and wetland habitats in southwestern United States. These habitats may be permanently or seasonally wet. The basic criterion for the inclusion of a species is its ability to withstand a permanent or seasonally long submersion of at least its root system. This will unavoidably include some ubiquitous species. In addition, plants classed as phreatophytes, or those plants whose deeply penetrating roots tap the groundwater, are included. The term 'aquatic' represents one extreme condition of habitat covered by this research project, and is used to designate those plants that can attain their life cycle only in water. The term 'wetland' incorporates all other conditions of habitat, including the other extreme. It is used to designate those plants that grow either in perpetually wet places, such as permanent marshes and bogs, or that can tolerate seasonal inundation and grow in vernal pools or places of fluctuating water levels, such as savannahs, to those plants that are notoriously ubiquitous and can tolerate excessively wet to desertic conditions. (Woodard-USGS)
W73-04999

DYNAMIC SIMULATION OF PLANT GROWTH AND ENVIRONMENT IN THE GREENHOUSE,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
T. Takakura, K. A. Jordan, and L. L. Boyd.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 5, p 964-971, May 1971. 8 fig, 1 tab, 20 ref, 2 append.

Descriptors: *Plant growth, *Computer models, *Greenhouses, Automation, *Simulation analysis, Model studies.

The effects of environmental conditions on the plant leaf within a greenhouse have been simulated by hybrid techniques on the digital computer. The resulting simulation model provides better analysis of the relationship between plant leaf temperature and the environment. Expanding this model, prediction of the plant photosynthesis in the greenhouse and computer control of greenhouses can be achieved. (Skogerboe-Colorado State)
W73-05003

MODELING SUBSYSTEMS FOR COTTON--THE COTTON PLANT SIMULATION,
Arizona Univ., Tucson. Dept. of Agricultural Engineering.
H. N. Stapleton, and R. P. Meyers.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 5, p 950-953, May 1971. 11 fig, 1 tab, 4 ref.

Descriptors: *Computer models, *Plant growth, *Cotton, Mathematical models, Fiber crops, *Simulation analysis, Model studies, Decision making, *Distribution systems.
Identifiers: *Soil moisture tension.

The methodology for a simulation for the cotton plant's dynamic development should provide a basis for simple input/output models, and for models permitting complex distributive analysis of subsystems and parallel systems in the ecology. The practical applications permit the development of information which can be used as input to decision making in the cotton production system. (Skogerboe-Colorado)
W73-05004

MONOGENETIC TREMATODES OF CYPRINODONT FISHES IN THE NEAR EAST,
Makerere Univ., Kampala (Uganda). Dept. of Zoology.
I. Paperna.
Zool Anz, Vol 188, No 1/2, p 114-116, 1972, Illus.
Identifiers: Ancyrocephalus-Salinus, Aphanius-Dispar, Aphanius-Fasciatus, Aphanius-Mento, *Cyprinodont fishes, *Parasites (Fish), Gyrodactylus-Lagoonaris, *Monogenetic trematodes.

In parasitological surveys carried out in 1957-1964, and more recently in 1968-1970, ectoparasites of Aphanius dispar, A. fasciatus, and A. mento were studied. Ancyrocephalus salinus was already reported as a specific parasite of A. dispar, and is presently known from this species in several localities. Neither A. dispar nor A. fasciatus was infested with this species in Bardawil Lagoon in north Sinai, but in this lagoon both species were found infested with Gyrodactylus lagoonaris. The finding of Ancyrocephalus salinus in populations of A. dispar in the Red Sea, the Mediterranean, and the relic one in the Dead Sea springs suggests a link between the fish populations of these 3 areas. Parasite specimens of A. salinus from all 3 areas have identical morphology.--Copyright 1972, Biological Abstracts, Inc.
W73-05010

FAUNA, BIOLOGY AND SOME CHARACTERISTICS OF THE DISTRIBUTION OF BLACK FLIES (DIPTERA, SIMULIIDAE) IN THE AK-BURA RIVER IN KIRGHIZIA, (IN RUSSIAN),
E. O. Konurbaev, E. O. Omorov, and D. T. Tadzhibaev.
Entomol Obozr. Vol 51, No 1, p 59-65, 1972. Illus. English summary.
Identifiers: *Ak-Bura River, *Black flies, Cnephia, Diptera, Distribution, *Fauna, Flies, Kirghizia, River, Simuliidae, Tetisimulium, Wilhelmia.

Long-term, regular observations in the Ak-Bura river (Alai range, Kirghizia) showed that Simuliidae hatch all year round. The black fly fauna is represented by 12 species belonging to 4 genera. Most of them are inhabitants of mountain and high-mountain running waters. The upper course of this river is quantitatively the zone of the genus Cnephia, the middle course is the zone of the genus Tetisimulium and the lower watercourse is the zone of the genus Wilhelmia. Species of Cnephia recorded from the upper watercourse are monocyclic. Their pupation and emergence take place in the second half of July and Aug. Species found in the middle and lower courses of the river are polycyclic and have no less than 2 generations a year.--Copyright 1972, Biological Abstracts, Inc.
W73-05041

METACERCARIAE OF THE GENUS DIPLOSTOMUM FROM FISH OF KAZAKHSTAN, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Zoologii.
A. I. Agapova, and K. S. Galieva.
Parazitologiya, Vol 6, No 2, p 148-153. 1972. Illus. English summary.
Identifiers: *Diplostomum, Diplostomum-phoxini, Diplostomum-pusillum, Fish, Genus Kazakhstan, *Metacercariae, Nemachilus-strauchi, Phoxinus-i-tschekanowskii, USSR.

Metacercariae of diplostomatids were frequently recorded from fishes of Kazakhstan and belonged to several distinct species. Diplostomum pusillum was found in the eyes of Nemachilus strauchi and D. phoxini was found in the brain of Phoxinus tschekanowskii.--Copyright 1972, Biological Abstracts, Inc.
W73-05067

STUDIES ON THE FROST HARDINESS OF CHESTNUT TREES: V. INFLUENCE OF TIME OF CESSATION OF SHOOT GROWTH ON HARDINESS (IN JAPANESE),
M. Sawano.
Sci Rep Fac Agric Kobe Univ., Vol 9, No 1/2, p 11-14, 1971, Illus, English summary.
Identifiers: Cambium, Cessation, *Chestnut-D, *Frost, Gibberellic-Acid, Hydrazide, Photoperiod treatment, Shoot growth, Starch, Time, Trees.

The time of cessation of growth was controlled by photoperiod treatments and applications of GA and maleic hydrazide (MH). Growth of the extension shoot stopped at about a half month after the start of the short day (8 hr) period. Under long day

(16 hrs) conditions, the extension growth continued for 2 mo. longer. The effects of GA applications were not observed. The MH solution injured shoot tops and younger leaves. In Sept., changes in the physiological characters in shoots occurred decrease of water content, increase of osmotic concentration of cell sap, accumulation of starch and decline of cambium activity. These changes were observed at the same time on each treatment regardless of the time of cessation of growth, except the one in which the growth continued till so late in the season. When the shoot growth stopped early in summer, no differences on hardiness were observed regardless of the time of growth cessation within treatments, but when growth continued till late Sept. hardening was delayed as shoots did not mature well.--Copyright 1972, Biological Abstracts, Inc.
W73-05071

STUDIES ON THE FROST HARDINESS OF CHESTNUT TREES: VI. HARDINESS OF SHOOTS AS AFFECTED BY DEFOLIATION IN EARLY FALL (IN JAPANESE),
M. Sawano.
Sci Rep Fac Agric Kobe Univ., Vol 9, No 1/2, p 15-19, 1971, Illus, English summary.
Identifiers: Carbohydrates, *Chestnut-D, *Defoliation, *Frost, Shoots, Trees, Seasonal.

The effect of defoliation on frost hardiness was studied with shoots of the current growth of young chestnut trees, cultivar 'Gin-yose,' by removing leaves to various degree in Sept. Water and carbohydrate contents of shoots were also studied with relation to hardiness. The development of hardiness of shoots with all leaves removed were extremely slow, and shoots failed to obtain sufficient hardiness during winter. The hardiness of these shoots decreased early in spring. The hardiness of shoots on defoliated trees were not significantly different from that of non-defoliated trees. There were no significant differences of water, starch and total sugar contents in shoots between defoliated and non-defoliated trees. In trees with all leaves removed, water content of shoots tended to decrease slightly, and remained fairly high during winter; starch content was extremely low in the fall, and consequently, the content of total sugar in shoots was lowest in winter. The content of reserve starch in roots was affected by defoliation. The total sugar content of roots indicated no difference among the treatments.--Copyright 1972, Biological Abstracts, Inc.
W73-05072

INITIAL OBSERVATIONS ON THE INTRODUCTION OF P. CARIBAEA IN CEYLON AND CERTAIN ROOTING, TRANSPIRATION AND MYCORRHIZAL STUDIES ON SEEDLINGS OF TWO PROVENANCES OF THIS SPECIES UNDER CONTROLLED CONDITIONS,
Forestry Dept., Colombo (Ceylon).
S. Muttiah.
Ceylon For, Vol 9, No 3/4, p 98-141, 1970, Illus.
Identifiers: Boletus, Cenococcum, *Ceylon, Mycorrhizal, *Pinus-Caribaea-G, Pinus-Caribaea-Var-Bahamensis-G, Pinus-Caribaea-Var-Hondurensis-G, Provenances, Rooting, Seedlings, *Transpiration.

P. caribaea vars. hondurensis and bahamensis can be established successfully in the 'dry patana' grass land montane zone. The possibility of growing this species in the 'dry' zone was studied. Heavy initial mortality is attributed to severe internal moisture stress in the plants during the period of prolonged drought, and rotting was restricted. The introduced mycorrhiza of a Boletus type from the montane zone was replaced by a Cenococcum type infection probably during the drought. The var. hondurensis had a significantly higher (at the 0.1% probability level) percentage root mass and root/shoot ratio than bahamensis under all the watering treatments. The intensity of watering had a significant linear effect on these parameters which increased with decrease in watering. There was no significant difference in seminal root lengths between the 2 varieties under any of the treatments. 'Survival' appeared to be higher in bahamensis than honduresnis particularly under low soil moisture conditions. An analysis of periodic height measurements showed that although var. hondurensis grew significantly faster before the commencement of the watering treatments, there was no difference at the end because of the faster rate of growth of the var. bahamensis. The root synthesis experiment carried out with 4 different fungi known to be mycorrhizal resulted in heavy mortality, poor growth and an extremely low rate of infection. This appeared to have been mainly because of deficiency of the light factor, especially the IR.--Copyright 1972, Biological Abstracts, Inc.
W73-05075

THE INFLUENCE OF SOIL MOISTURE ON THE FREQUENCY OF CYANOGENIC PLANTS IN POPULATIONS OF TRIFOLIUM REPENS AND LOTUS CORNICULATUS,
Dudley Coll. of Education (England). Dept. of Science.
W. Foulds.
Heredity, Vol 28, No 1, p 143-146, 1972.
Identifiers: *Cyanogenic plants, Drought, Enzymes, Glucosidase, Glucoside, Lotus-Corniculatus-D, Phenotypes, Polymorphism, *Soil moisture, Trifolium-Repens-D.

Populations of T. repens and L. corniculatus frequently contain cyanogenic and acyanogenic plants. Experimental work predicts that T. repens plants containing the cyanogenic glucoside should be infrequent in droughty habitats. The prediction is upheld for wild populations of T. repens, but the polymorphism of cyanogensis in L. corniculatus is not affected by drought conditions in the same way. It appears that the cyanogenic phenotype was disadvantageous under drought conditions and yet, although the genetic polymorphism is the same in both species for beta-glucosidase enzyme and cyanogenic glucoside, the response to selection was different.--Copyright 1972, Biological Abstracts, Inc.
W73-05078

ECOLOGICAL STUDIES ON STREPTOCEPHALUS DICHOTOMUS BAIRD: (CRUSTACEA:ANOSTRACA),
Madurai Univ. (India). Dept. of Biological Sciences.
R. Bernice.
Hydrobiologia, Vol 39, No 2, p 217-240, 1972, Illus.
Identifiers: *Anostraca, Brachinella-Kugenumaensis, *Crustacea, Ecological studies, Streptocephalus-Dichotomus.

S. dichotomus occurs in a wide variety of shallow and temporary freshwater biotopes. The maximum period during which these animals occur was 18 wk. Winter populations live longer than the summer populations, mainly because water is longer available during winter. Studies on both seasonal and day time variations of the physicochemical factors show that there is not much difference in these factors between various ponds. The rate of increase in the population is more or less identical in all the different habitats investigated. There was generally a rapid increase in numbers initially followed by a rapid decline at the end of the growth phase of the population. The length frequency distribution in the different ponds shows that during any 1 season only a single population exists. Sex ratio does not appear to follow any definite pattern at any season in any pond and males and females occur until the final disappearance of the population. Females start to bear eggs when 1.7 cm long and the maximum number of eggs recorded in one brood pouch was 902. Two genera, Branchinella kugenumaensis and S. dichotomus were seen in all ponds. Irrespective of the seasons B. kugenumaensis population always preceded that of S. dichotomus, the former being short lived (3-5 wk only).--Copyright 1972, Biological Abstracts, Inc.
W73-05084

EXPERIMENTAL APPARATUS FOR THE STUDY OF THE BEHAVIOR OF BENTHIC SPECIES IN RUNNING WATER, (IN FRENCH),
Toulouse Univ. (France). Institut de Mecanique des Fluides.
D. Trivellato, and H. Decamps.
Ann Linmol., Vol 7, No 2, p 145-155. 1971. Illus. English summary.
Identifiers: *Equipment, *Aquatic life, Behavior, *Benthic species, Invertebrates.

The experimental apparatus is used to measure accurately the velocity of the water, and utilizes the photography of aluminum particles in a flashing light. The apparatus was designed for the purpose of observing the behavior of small benthic invertebrates in a current of known characteristics at all points in the apparatus.--Copyright 1972, Biological Abstracts, Inc.
W73-05120

ANTAGONISTIC RELATIONS AMONG FUNGI FROM THE STAVJNA RIVER: FUNGI IMPERFECTI AND AQUATIC PHYCOMYCETES, (IN SERBO-CRVATIAN),
Sarajevo Univ. (Yugoslavia). Bioloski Institut.
B. Ristanovic.
Acta Biol jugosl Ser B Mikrobiol, Vol 7, No 2, p 149-154. 1970. English summary.
Identifiers: Antagonistic relations, Aquatic phycomycetes, Dematiaceae, Dictyuchus monosporus, *Fungi, Fungi-imperfecti, Moniliaceae, Pencillium rugulosum, Rivers, Saprolegnia diclina, Saprolegnia ferax, *Stavjna River, Yugoslavia.

The antagonists were cultivated on Czapek-Dox liquid medium. The relation to test organisms was carried out. Of the antagonists, 46.9% had inhibitory action on Saprolegni-aceae. Penicillium rugulosum depressed the growth of all test organisms. Saprolegnia ferax was the most resistant but Dichtyuchus monosporus and S. diclina were the most sensitive to the strains of Moniliaceae and Dematiaceae.--Copyright 1972, Biological Abstracts, Inc.
W73-05121

ECOLOGO-GENETIC SERIES OF PLANT COMMUNITIES AS INDICATORS OF NATURAL PROCESSES, (IN RUSSIAN),
S. V. Viktorov, M. T. Ilyushina, and I. V. Kuz'mina.
Ekologiya, Vol 1, No 6, p 3-8. 1970.
Identifiers: *Plant populations, Ecology, Genetic, *Landscape indicators, Land, Plants, Processes, Land reclamation.

The use of plant communities as indicators of natural processes during itinerary hydrological and engineering geological surveys related with land reclamation is suggested. The concept of landscape-genetic series is introduced and an analysis of the microfacies structure of the landscape is recommended as the principal method of their detection. Specific examples of landscape indicators of certain processes are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05122

EFFECT OF FLOODS ON THE ONDATRA POPULATION IN THE FLOODPLAIN OF THE LOWER OB RIVER, (IN RUSSIAN),
N. I. Chesnokov.
Ekologiya. Vol 2, No 5, p 71-75. 1971.

Identifiers: Floodplains, *Floods, Lower, *Ob River (USSR), *Ondatra, Population, Rivers, USSR.

Floods are an important factor on which the existence of Ondatra in the flood plain depends. Flooding which is moderate in height and duration creates favorable conditions for animal habitation. High and long flooding or consecutive short and low yearly floods have negative effects on the numbers and condition of the animals. The population varies because of variations in the ecological conditions. High flooding causes direct death of the animals, disturbs reproduction and undermines the food base. Repeated short and low flooding decreases the area of the grounds and their quality.--Copyright 1972, Biological Abstracts, Inc.
W73-05141

PHYSIOLOGICAL STUDIES ON PHYCOMYCETE FROM A MANGROVE SWAMP AT CANANEIA, SAO PAULO, BRAZIL,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
A. Ulken.
Veroeff Inst Meeresforsch Bremerhaven. Vol 13, No 2, p 217-230. 1972. Illus.
Identifiers: Adaptations, *Brazil, Cananeia, *Mangrove-D, Phlyctochytrium-Mangrovii, *Phycomycetes, Physiological studies, Salinity, Species, Spores, Swamp, Temperature, Zoo spoores.

Phlyctochytrium mangrovii sp. nov. is described. The fungus was well-adapted to the habitat in terms of temperature and salinity optima for growth. Zoospores were also able to creep on the mud for several hours at low tide.--Copyright 1972, Biological Abstracts, Inc.
W73-05144

A COMPARISON OF THE THIAMINE CONTENT IN TISSUES OF CERTAIN TAPEWORMS IN FISH, (IN RUSSIAN),
Akademiya Nauk URSR Kiev. Instytut Hidrobiologii.
L. V. Strazhnik, and O. N. Davydov.
Gidrobiol Zh. Vol 7, No 5, p 98-101. 1971. Illus.
Identifiers: Carbohydrates, Fish tissues, Ligula-Intestinalis, Metabolism, Nutrition, Perch, Pike, Roach, Seasonal, *Tapeworms, *Thiamine, Triaenophorus-Nodulosus.

The thiamine content in the larva and adult Triaenophorus nodulosus and the Ligula intestinalis larva was studied in the perch, pike and roach. The T. nodulosus larva in the liver had the highest thiamine content. Fish tissue infected with cestodes had a lower thiamine content than healthy tissue. The seasonal changes in the thiamine content of L. intestinalis larva was related to the host's nutrition in the various seasons and possibly to the carbohydrate metabolism.--Copyright 1972, Biological Abstracts, Inc.
W73-05146

PRODUCTIVITY AND SOLAR ENERGY CONVERSION IN REEDSWAMP STANDS IN COMPARISON WITH OUTDOOR MASS CULTURES OF ALGAE IN THE TEMPERATE CLIMATE OF CENTRAL EUROPE,
Ceskoslovenska Akademie Ved, Trebon. Botanicky Ustav.
D. Dykyjova.
Photosynthetica (Praha). Vol 5, No 4, p 329-340. 1971. Illus.
Identifiers: *Algae, Cultures, Europe, Growth, Macrophytes, Mass, Nutrients, Phragmites-Communis-M, *Productivity, *Reed-M, Scirpus-Lacustris-M, *Solar energy, Swamps, Temperate climates, Typha-Angustifolia-M.

The productivity of photosynthetically highly effective systems of littoral emergent macrophytes, e.g., Phragmites communis Trin, Typha angustifolia L., and Scirpus lacustris L., is compared with that of intensive outdoor mass cultures of unicellular algae under the same climatic conditions. The favorable spatial structure and orientation of the assimilatory organs of emergent aquatic plants, the high values of the leaf area index, the large amount of storage assimilates in underground perennial rhizomes as well as the growth unlimited by water or nutrients at contemporary auxotrophication of freshwater littoral habitats enable larger yields and energy conversion efficiencies in natural canopies as compared with large scale cultures of unicellular algae in outdoor equipment.--Copyright 1972, Biological Abstracts, Inc.
W73-05150

GROUNDWATER RELATIONS OF LITTER AND MARSHY MEADOWS IN THE NORTHERN SWISS PLAIN, (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Geobotany.
F. Kloetzli.
Beitr Geobot Landesaufn Schweiz. 52: p 1-296, 1969, Illus, English summary.
Identifiers: Grasses-M, *Groundwater levels, *Litter, *Marshy meadows, Swiss plains.

The plant communities studied are permanently wet to alternating wet-dry, the vegetation is dominated by graminids, and they are usually harvested once a year. They are not cultivated in any way. The groundwater level is the main ecologic factor. The yearly groundwater regime is indicated by a 'duration diagram' giving the time during which the groundwater level is higher than a certain depth. Such curves are convex in humid habitats with short dry period, concave in areas of alternating humidity, but dominating dryness. The communities are partly derived from fens created by the filling in of lakes, partly from springs, and partly cover naturally humid hillsides. The electrolyte status is generally favorable. About 25 major plant communities are distinguished and the relevant character species discussed. The traditional utilization of these plant communities is now being discontinued, and a natural succession takes place towards forest or copse. Under more intensive cultivation ordinary meadows are created.--Copyright 1972, Biological Abstracts, Inc.
W73-05151

SOME ASPECTS OF GERMINATION OF DESERT SEEDS,
Ain Shams Univ., Cairo (Egypt). Coll. for Women.
M. A. Hammouda, and Z. Y. Bakr.
Phyton (Horn Austria). Vol 13, No 3/4, p 183-201, 1969, Illus.
Identifiers: *Desert, Dormancy, *Germination, Light, Moisture, Salinity, *Seeds, Temperature, Egypt.

Two sets of seeds from the desert east of Cairo, (12 spp.) and the semi-desert, west of Alexandria, (29 spp.) were studied. Laboratory experiments in incubators and observations on outdoor pots were made. The roles of different factors including temperature, rainfall, light and salinity were elucidated. Some seeds showed a wide temperature range for germination (15C-35C) while others showed narrow range. Optimum temperatures for germination varied with species. The majority have mild optimal temperature (20-25C). Germination of seeds of a considerable number of species commonly occurs in winter months, if rain water is available. Rainfall of 5 mm was insufficient for germination of any seeds unless supplemented by small amounts moistening the soil surface, but 10 mm and 20 mm rainfall suffice for most seeds. Light sensitive seeds were Achillea santolina, Caylusea hexagyna, Arthrocnemon glaucum and Hyoscyamus muticus, whose germination was stimulated by light. Germination of Erynigium creticum, Enarthrocarpus strangulatus and Eurucaria microcarpa was promoted by darkness. Species such as Zygophyllum simplex, Echinops spinosissimus and Bromus rubens showed high salinity tolerances while species such as Fagonia arabica, Asphodelus microcarpus and Arthrocnemon glaucum showed low tolerances. Few seeds can germinate at an osmotic press of 15 atmospheres. Dormancy regulation was also discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05152

DORMANCY OF HIBERNACLES OF GLAUX MARITIMA L. AND ITS ADAPTATION TO SALINITY, (IN FRENCH),
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
Michel Grandin.
Oecol Plant. Vol 6, No 2, p 203-208, 1971, Illus, English summary.
Identifiers: Adaptation, Dormancy, *Glaux maritima D, Growth, *Hibernacles, Low, Reproduction, *Salinity, Temperature.

G. maritima better resists high salinity when its hibernacles are refrigerated for a long period. The number of flowering plants is maximal when the salinity is low. A cold climate will be better for sexual reproduction when the salinity is low, and for vegetative growth when the salinity is high.--Copyright 1972, Biological Abstracts, Inc.
W73-05160

ON THE ECOLOGY OF MIOMBO WOODLANDS, (IN GERMAN),
Muenster Univ. (West Germany). Institut fuer Angewandte Botanik.
W. Ernst.
Flora (Jena). Vol 160, No 3, p 317-331, 1971, Illus. English summary.
Identifiers: Brachystegia spiciformis D, Distribution, *Ecology, Julbernardia globiflora D, *Miombo woodlands, Pinnule, Rhodesia, Temperature, Uapaca kirkiana, Zambia.

Mositure and temperature in some species of miombo woodland (Julbernardia-Brachystegia) in Zambia and Rhodesia were studied during the rainy season (Dec. 1969) and the first period of the dry season (Jan.-Feb. 1970). The moisture of the miombo woodland is well-balanced: the osmotic pressure of woody species is between 7 and 20 atm., the average rate of transpiration between 3 and 10 mg/g.min. The leaf temperature more or less follows the air temperture. The heat resistance in leaves and buds of B. spiciformis is near +48C. The frost resistance of the stems, estimated by the damage during the heavy frost of winter 1968, is low: -2C in Uapaca kirkiana, -4C in B. spiciformis and J. globiflora. Many miombo species fold up their pinnules. The evening process of closing the pinnules seems to be an autonomic diurnal movement, however shutting movements during very hot periods of the day are influenced by the temperature of air and leaves, respectively. The phytogeographical distribution of miombo elements can be correlated with heat and frost resistance of the trees.--Copyright 1972, Biological Abstracts, Inc.
W73-05163

CONTRIBUTION TO THE STUDY OF THE AQUATIC MYCOFLORA OF DUDU SWAMP AND A PORTION OF THE DIMBOVITZA RIVER (VILLAGE OF CHIAJNA TO PODUL IZVOR),
Bucharest Univ. (Rumania). Faculty of Biology.
N. M. Toma.
Rev Roum Biol Ser Bot. Vol 16, No 1, p 7-24. 1971. Illus.
Identifiers: Achlya-Bisexualis, Aphanomyces-Laevis, *Aquatic mycoflora, Chiajna, Dimbovitza, Dudu, Flora, Isoachlya-Intermedia, Isoachlya-Monilifera, Izvor, Podul, Records, River, *Romania, Swamp, Woronina-Polycistis.

Twenty-seven taxa were found belonging to the Saprolegniaceae (20), Leptomitaceae (2), Olpidiopsidaceae (2), Woroninaceae (1), and Pythiaceae (2). The genus Alphanomyces De Bary and the species Isoachlya intermedia (Coker et Harvey) Coker, I. monilifera (De Bary) Kauffm., Achlya bisexualis Coker and Couch, Aphanomyces laevis De Bary, and Woroninia polycistis Cornu were new Romanian records. I. intermedia and A. bisexualis are rare in Europe.--Copyright 1972, Biological Abstracts, Inc.
W73-05178

SNOW-LAND COMMUNITIES OF REYKJANES PENINSULA, SW. ICELAND (PLANT COMMUNITIES OF REYKJANES PENINSULA, PART 4),
Geskoslovensek Akademie Ved, Prague. Botanicky Ustav.
E. Hadac.
Folia Geobot Phytotaxon. Vol 6, No 2, p 105-126. 1971. Illus.
Identifiers: *Plant communities, *Iceland, Mosses, Peninsula, Plants, Poa-M, Reykjanes, Rhodiola-D, Salix-D, Sibbaldia-D, Snow.

Snow-land communities in Reykjanes Peninsula are represented by the associations Hylocomio-Salicetum herbaceae, Rhodiolo-Bartsietum alpinae and Rhytidiadelpho-Poetum alpinae, belonging to a new alliance, Antitrichio-Rhodiolion, and by Anthelietum Juratzkanae, Sibbaldio-Salicetum herbaceae and Sibbaldietum procumbentis, belonging to the alliance Salicion herbaceae s.l. Their syntaxonomy and ecology are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05179

NOTE ON THE ECOLOGY OF STONE RING VEGETATION ON SPITZBERGEN (IN DUTCH),
H. F. Linskens.
Ber Deut Bot Ges. Vol 83, No 5/6, p 261-264. 1970. Illus. English summary.
Identifiers: Ecology, Norway, Soils, *Spitzbergen, *Stone ring vegetation, Temperature, Vegetation.

Measurements in the soil showed a higher temperature, also at depth, under the stone rings. Under the central, wet soil spots which are usually not covered with vegetation, temperature was lower. The temperature gradient causes a permafrost border which runs parallel to the soil surface. It is concluded that temperature conditions in the soil contribute to the net-like vegetation patterns.--Copyright 1972, Biological Abstracts, Inc.
W73-05183

A HUMMOCK OF SPAGNUM: AN EXAMPLE OF A NATURAL ION-EXCHANGING COLUMN (IN GERMAN),
Kiel Univ. (West Germany). Botanisches Institut.
K. Brehm.
Beitr Biol Pflanz. Vol 47, No 2, p 287-312. 1971. Illus. (English summary).
Identifiers: Calcium, *Hummocks, Ion, Potassium, Sodium, *Sphagnum, Sphagnum-Magellanicum, Transpiration, Cations.

The cation contents of hummocks of S. magellanicum were investigated. The Sphagnum-plants were divided into 5 sections and the contents of each of these measured. Artificial hummocks of Sphagnum material are used as models for living hummocks under natural conditions. The transpiration of water in the upper parts causes Na and K to move upwards. There the monovalent cations accumulate to a great extent (60-560 times) in the adhering water. Divalent cations are bound to the cation exchanger in lower sections of the plants. The pH of the adhering water may fall from 5.3 to 2.9 or lower on account of the cation exchanger in the cell walls of the Sphagnum. Hummocks were investigated under natural conditions in the course of a year. Samples of Sphagnum were regularly taken from 2 different places in a bog. The 'free place' (open) and the 'window place' (area covered to prevent rainfall from touching plants) showed characteristic differences in cation content. In the 'free place' the content of Na, K and Ca changed rapidly according to periods of rain or dryness. The effect was the most distinct in the apical parts whereas lower sections had relatively constant contents. The 'window samples' showed high accumulation rates of the cations in the apical parts (100 times or more). In the 'free place' Na and K are fixed to the exchanging sites corresponding to the varying contents of the adhering water. Nevertheless the Ca-contents were nearly constant along the Sphagnum plants. There is a relatively high amount of Ca in the upper parts of the Sphagnum because bivalent cations are bound to the exchanging sites stronger than monovalent cations. The very low values of pH may prevent Ca from binding. The contents of Na of the living cell are not increased in spite of the great accumulation of this ion in the adhering water. During the main period of growth there seems to be a slower increase or even a decrease of the contents of the cation exchanger and of the living cells. A hummock can be compared with a column of cation exchanger as used in laboratories.--Copyright 1972, Biological Abstracts, Inc.
W73-05192

ECOLOGICAL AND PHYTOCENOTIC CHARACTERISTICS OF THE WATER CHESTNUT (TRAPA NATANS L.) IN FLOODPLAIN BASINS OF THE VLADIMIR DISTRICT (IN RUSSIAN),
Gosudarstvennyi Pedagogicheskii Institut, Vladimir (USSR).
M. P. Shilov, and T. N. Mikhailova.
Ekologiya. Vol 1, No 5, p 53-59. 1970.
Identifiers: Basins, Chemistry, Ecology, Floodplains, Phytocenotic, Soils, *Trapa natans D, USSR, Vladimir, *Water chestnut D.

T. natans is an anthropogenic relic, since it is disappearing not only as a consequence of present-day unfavorable climatic conditions but also primarily under the effect of the anthropogenic factor. A generalization of its ecological and phytocoenotic characteristics, particularly its confinement to certain soils, depths, water chemistry, aquatic plants, etc. is given. Recommendations for its preservation are offered.--Copyright 1972, Biological Abstracts, Inc.
W73-05193

2J. Erosion and Sedimentation

SOIL-LOSS CONSIDERATIONS IN CHAPARRAL-TO-GRASS CONVERSIONS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-04602

FREE FALLING PARTICLE IN DENSITY STRATIFIED FLUID,
Puerto Rico Univ., Mayagues. Water Resources Research Inst.
C. Y. Kuo.
Available from the National Technical Information Service as PB-214 499, $3.00 in paper copy, $0.95 in microfiche. Completion Report UPRICO-WRRI-PR-72-32, October, 1972. 48p, 12 fig, 1 tab, 7 ref, 2 append. OWRR A-032-PR (1).

Descriptors: *Stratification, *Sedimentation, Hydrodynamics, *Thermocline, Settling velocity.

Free falling particle due to gravity in a linear density stratified fluid was investigated theoretically and experimentally. The equations governing particle motion in a homogeneous viscous fluid can be applied to this case if the density stratified fluid body is considered to be composed of infinite homogeneous layers of finite thickness. The particle motion is found to be a function of the fluid density gradient. The effect of the density gradient is very pronounced for the particle-fluid density ratio almost equal to one. For high particle-fluid density ratios, the density gradient effect is not appreciable. The proposed calculation of particle displacement can describe-the phenomena of particle sedimentation in zones of thermoclines in most natural water bodies.
W73-04633

SOME OBSERVATIONS ON THE MOTION OF THE HEAD OF A DENSITY CURRENT,
Nation Research Council of Canada, Ottawa (Ontario). Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-04739

ON PRESERVING THE SAND PATTERNS IN RIVER MODELS,
Khartoum Univ. (Sudan).
For primary bibliographic entry see Field 08B.
W73-04740

CRITICAL SHEAR STRESS FOR SEDIMENT MIXTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Gessler.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Dhydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 1-8, 1972 (release date). 3 fig, 6 ref.

Descriptors: *Scour, *Shear stress, *Sediment transport, *Particle size, *Alluvial channels, Degradation (Stream), Sedimentation, Erosion, Stream erosion, Turbulent flow.
Identifiers: *Sedimentary armoring, *Critical shear stress (Scour).

The critical shear stress of material consisting of particles with a single grain size has been extensively investigated for many years. However, very little information is available on the behavior of sediment mixtures under various shear stresses. The critical shear stress of a sediment mixture is defined as the shear stress which will develop the coarsest armor coat, or the armor coat with the largest effective grain size. This approach gives results similar to those of a largely empirical criterion. The limited amount of experimental data available supports the concept. The sensitivity of both the computation and the physical process is discussed and design criteria are suggested. (Knapp-USGS)
W73-04742

CRITICAL MEAN EROSIVE FORCE, CONSIDERING FLUCTUATIONS DUE TO TURBULENCE, OF THE EROSIVE FORCE ACTING ON AN ALLUVIAL BED (FORCE D'ENTRAINEMENT MOVENNE CRITIQUE, AVEC PRISE EN CONSIDERATION DES FLUCTUATIONS DUES A LA TURBULENCE, DE L A FORCE D'ENTRAINEMENT AGISSANT SUR LE MATERIAU D'UN LIT ALLUVIONNAIRE),
Eidgenoessische Techische Hochschule, Zurich (Switzerland). Lab of Hydraulic Research and Soil Mechanics.
A. Gunter.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 9-15, 1972 (release date). 6 fig, 3 ref.

Descriptors: *Scour, *Shear stress, *Sediment transport, *Particle size, *Alluvial channels, Degradation (Stream), Sedimentation, Erosion, Stream erosion, Turbulent flow.

An interruption of the bed-load transport in an alluvial channel causes a deformation of the bed. A gradual change of the longitudinal slope continues until the hydromechanical stress reaches a critical value. The fluctuations of shear stress caused by tubulence influence the value of the critical shear stress and depend on the Reynolds number of the discharge. A function is derived to calculate critical shear stress in beds composed of uniform material for Reynolds numbers less than 150,000. The results of laboratory tests carried out with natural (nonuniform) material verify the relationship between Reynolds number and the fluctuations of the shear stress. (Knapp-USGS)
W73-04743

THE EFFECT OF HIGH TURBULENCE ON EROSION OF ALLUVIUM (L'INCLUENCE DE LA HAUTE TURBULENCE SUR L'ENTRAINEMENT DES ALLUVIONS),
Institutul de Studii si Cercetari Hidrotehnice, Bucharest (Rumania).
E. Razvan.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 17-23, 1972 (release date). 3 fig, 4 ref.

Descriptors: *Turbulent flow, *Scour, *Shear stress, *Sediment transport, Turbulence, Vortices, Sedimentology, Eddies, Alluvial channels.
Identifiers: Macroturbulence.

The critical velocity in a macroturbulent flow depends on pulsations of high frequency and large amplitude. Considering the quilibrium conditions of a homogeneous isotropic alluvial bed, a relation for the critical velocity is given. This simple relation includes a correction factor for the physical reality of the macroturbulent flow. (Knapp-USGS)
W73-04744

PROGNOSIS OF GENERAL DEFORMATION OF NATURAL AND ARTIFICIAL ALLUVIAL BEDS COMPOSED OF NON-UNIFORM MATERIAL,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
T. E. Mirtskhoulava, and A. V. Magomedova.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 25-33, 1972 (release date). 1 fig, 2 tab, 10 ref.

Descriptors: *Sour, *Shear stress, *Sediment transport, *Particle size, *Alluvial channels, Degration (Stream), Sedimentation, Erosion, Stream erosion, Turbulent flow, Statistical methods.

The coarsening resulting in natural pavement of the surface layer of noncohesive material with scour is characterized by a mean diameter of suspended particles, the value of which varies in the process of scour. This problem is reduced to a joint solution of equations (by means of the method of successive approximations) to effect estimation of the mean diameter of the coarse surface layer, the stabilization of the scour processes, and the minimum diameter of paving particles. Comparison of the calculated data with those of laboratory and field investigations gives satisfactory coincidence. (Knapp-USGS)
W73-04745

NATURAL ARMOURING AND ITS EFFECT ON DEFORMATIONS OF CHANNEL BEDS FORMED BY MATERIALS NON-UNIFORM IN SIZE,
Politekhnicheskii Institut, Leningrad (USSR).
V. S. Knoroz.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 35-42, 1972 (release date). 2 fig.

Descriptors: *Scour, *Shear stress, *Sediment transport, *Particle size, Alluvial channels, Degradation (Stream), Sedimentation, Erosion, Stream erosion, Turbulent flow.

The mechanism of natural sedimentary armoring is described. Formulae are given for calculating the depth of scour and the mean flow velocity at which armoring is completed. Emphasis is placed on the fact that turbulence of the flow in channels formed by nonuniform material is usually higher than that in channels constructed in uniform material, therefore the erosion resistance of the uniform materials is reduced. Channels composed of nonuniform materials are scoured even at noneroding velocities calculated by the formulae for uniform materials. In this connection the use of formulae for uniform materials to compute noneroding velocities for nonuniform materials is shown to be impossible. Graphs are presented characterizing the effect of natural armoring, and a new calculation procedure is given for erosion-resistant channel beds designed in noncohesive different sized materials. (Knapp-USGS)
W73-04746

DEFORMATION OF ALLUVIAL BEDS COMPOSED OF MATERIALS OF EXTENDED GRANULOMETRY (DEFORMATION DES LITS ALLUVIONNAIRES COMPOSES DE MATERIAUX A GRANULOMETRIE ETENDUE),
Ecole Nationale Superieure d'Hydraulique de Grenoble (France).
M. Bouvard.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Resarch, Paris, August 29-September 3, 1971, Vol 3, p 51-55, 1972 (release date). 2 ref.

Descriptors: *Hydraulic models, *Sediment transport, *Hydraulic similitude, Sediment load, Scour, Stream erosion, Sedimentology, Particle size.

Scaled models of solid transport in channels are usually considered not only as a tool for solving a given problem, but also as 'scaled rivers' on which physical laws of solid transport could be determined, then extrapolated to natural rivers. For this case, experiments are usually very difficult and expensive. Transport is determined by local characteristics, such as geometrical parameters (slope, width of the river bed) and granulometry of the materials. Some basic problems relevant to this approach when the granulometry distribution of the bed-materials is not uniform are discussed. The usual assumptions are not valid, and the results obtained from the model--as well as the resultant empirical formulas--are systematically low. The differences are usually extremely important but can be measured only by local experiments. (Knapp-USGS)
W73-04747

RIVER BED DEFORMATION CALCULATED BY PRACTICAL SEDIMENT DISCHARGE FORMULA,
Central Research Inst. of Electric Power Industry, Tokyo (Japan). Technical Lab.
H. Asada, and H. Ishikawa.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 57-64, 1972 (release date). 9 fig, 2 tab, 12 ref.

Descriptors: *Scour, *Sediment transport, *Bed load, Channel morphology, Data collections, Graded, Degradation (Stream), Sediment discharge, Sediment load, Reservoir silting.

The practical calculation methods of sediment discharge and river bed deformation in the upper and middle reaches of rivers are reviewed. Some of the sediment discharge formulae were examined through laboratory experiments in an attempt to show the non-uniqueness of their solutions. A practical sediment discharge formula is proposed on the basis of this examination. The empirical coefficient involved in this formula is determined by field observation. The data on sedimentation of a small reservoir were analyzed, and the empirical coefficients were obtained. Using this practical sediment discharge formula and the empirical coefficient, degradation below the dam and the process of sedimentation in the reservoir were calculated. Both bed lowering (degradation below the dam) and temporal variation of the grade curve of river bed show comparatively good agreement with observed values. (Knapp-USGS)
W73-04748

ON THE HYDROMORPHOMETRY OF ALLUVIAL BEDS OF MOUNTAIN RIVERS COMPOSED OF HETEROGENEOUS MATERIALS (QUESTIONS D'HYDROMORPHOMETRIE DES LITS ALLUVIAUX DES COURS D'EAU DE MONTAGNE FORMES DE MATERIAUX HETEROGENES),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Vodnogo Khozyaistva i Energetiki.
K. P. Artamonov, V. P. Talmaza, and A. N. Krochkine.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 65-74, 1972 (release date). 1 fig, 3 ref.

Descriptors: *Scour, *Shear stress, *Sediment transport, *Particle size, *Alluvial channels, Degradation (Stream), Sedimentation, Erosion, Stream erosion, Turbulent flow.

In alluvial beds composed of heterogeneous material, it is possible to define the mechanical structure of the sediments, characteristic diameters, Karman's parameters, vertical velocity distribution, Chezy's coefficients, stable roughness, width, average depth, scour velocity, stable longitudinal inclination, and the maximum depth of the bed erosion. The main factors acting in the stream are discharge of water and alluvium, longitudinal inclination size and particle-size distribution, relative bed roughness, and the speed of the stream. They may be used for calculations in both natural and regulated alluvail channels of mountain rivers. (Knapp-USGS)
W73-04749

MOVING CONDITION OF LARGE ROCK IN MOUNTAIN STREAM,
Osaka Prefectural Technical Coll., Neyagawa (Japan). Dept. of Civil Engineering.
A. Daido.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 75-82, 1972 (release date). 8 fig, 2 tab, 8 ref.

Descriptors: *Scour, *Particle size, *Turbidity, *Bed load, *Suspended load, *Sediment transport, Degradation (Stream), Tractive forces, Sediment load, Stream erosion, Sedimentology, Backwater.

The sediment discharge of a valley under heavy rain is often greater than expected, especially the movement of large rocks in streams shallower than the sizes of the rocks. The influence of turbidity and the difference in water level upstream and downstream of a rock with backwater and wake are analyzed. Critical tractive force is calculated considering the plasticity of clay, and the equation is the same form as that for critical tractive force of clear water. The other factors taken into consideration as the causes of the movement of a large

rock are the force acting about the rock's fulcrum and the hydrostatic pressure caused by the difference in the depth at upstream and downstream sides of the rock. (Knapp-USGS)
W73-04750

VARIATION OF BED FORM AND FLOW RESISTANCE IN ALLUVIAL CHANNELS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
B. C. Yen.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 83-90, 1972 (release date). 2 fig, 20 ref.

Descriptors: *Sediment transport, *Bed load, *Channel morphology, *Flow resistance, *Alluvial channels, Froude number, Reynolds number, Particle size, Hydraulic radius, Settling velocity, Slopes, Dunes, Ripple marks, Sedimentology, Dimensional analysis.

Through dimensional analysis and theoretical considerations, the bed form and the hydraulic resistance of alluvial channels are shown to be functions of the Froude number, Reynolds number, width to depth ratio, channel shape parameter, sediment size to hydraulic radius ratio, standard deviation of sediment particles, and sediment fall velocity to shear velocity ratio. Hence, any change in flow, channel, or sediment characteristics which would vary the magnitude of any one or more of these dimensionless parameters would cause changes in the bed form and flow resistance. For sediment-laden flow with large width-to-depth ratio and relatively uniform size particles, analysis of flume data indicates that as a first approximation the bed form is simply as function of the Froude number and the sediment size-hydraulic radius ratio. By using this simple relationship, variations of bed form due to changes in channel slope, cross section, discharge, or sediment size can be found. (Knapp-USGS)
W73-04751

ON THE OCCURRENCE OF BED FORMS IN ALLUVIAL CHANNELS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
H. M. Hill, A. J. Robinson, and V. S. Srinivasan.
In: Hydraulic research and its impact on the Environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 91-100, 1972 (release date). 2 fig, 2 tab, 15 ref.

Descriptors: *Sediment transport, *Bed load, *Channel morphology, *Flow resistance, *Alluvial channels, Froude number, Reynolds number, Particle size, Hydraulic radius, Settling velocity, Slopes, Dunes, Ripple marks, Sedimentology, Dimensional analysis, Hydraulic models, Flumes.

The conditions under which the various bed forms occur in alluvial channels are reviewed. Experiments were set up to establish the quantitative criteria for the development of bed forms. The resulting graphical relationships are presented and discussed. The experimental setup consisted of a concrete recirculating flume 122 ft long, 2 ft wide, and 2 ft deep. Three different sands with mean diameters of 0.17 mm, 0.33 mm, and 0.56 mm were used in the tests. The viscosity of water was varied over a considerable range by controlling the temperature. Beyond a certain size of the sand, ripples do not form in the bed material. Viscosity seems to have a definite influence on the criterion for the nonoccurrence of ripples. Dunes may be considered as bed forms developed from tilting of the flat bed. Then, flat bed conditions may be assumed to prevail on the long backs of the dunes. An instability in this flow would then cause the ripples to form as in the case of the flat bed flow. (Knapp-USGS)
W73-04752

ON THE FORMATION OF DUNES AND MEANDERS,
Queens Univ., Kingston (Ontario).
M. S. Yalin.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 101-108, 1972 (release date). 3 fig, 8 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Dunes, *Meanders, *Turbulence, Sediment transport, Bed load, Sedimentology, Turbulent flow, Mathematical studies, Stochastic processes, Uniform flow, Non-uniform flow.

The occurrence of dunes and meanders can be attributed to the law governing the correlation among the perturbations taking place in a turbulent flow. A systematic disturbance in the behavior of the largest macroturbulent eddies caused by a permanent discontinuity must be accompanied by the same and the reverse kind of disturbances occurring alternately, with equal length intervals, along the direction of flow. Dunes and meanders are the developed versions of the alternate erosions and accretions caused by these disturbances in the velocity field and thus in the transport capacity of the flow. (Knapp-USGS)
W73-04753

RIVER-BED VARIATIONS AT LONG CONSTRICTIONS,
Gifu Univ. (Japan). Dept. of Civil Engineering.
S. Komura.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 109-116, 1972 (release date). 9 fig, 1 tab, 5 ref.

Descriptors: *Scour, *Channel morphology, *Degradation (Stream), Alluvial channels, Stream erosion, Shape, Width, Hydraulic models.
Identifiers: *Channel constrictions.

Methods of predicting the equilibrium depth of scour for nonuniform bed material in long constrictions are presented. Relationships for the prediction of the equilibrium depth of scour are derived by applying dynamic and static equilibrium theories, and assuming that the bed configuration in an equilibrium state remains the same in both the constricted and unconstricted parts, but that the bed composition may be different. The armoring effect for nonuniform bed material is included in the prediction of the equilibrium depth of scour. Experimental results on the equilibrium depth of scour in long constrictions with a nonuniform bed material indicate that, when the rate of sediment supply into the constricted region is zero or nearly zero (in static equilibrium state), the equilibrium depth of scour depends on the variations of sediment size. If the rate of sediment supply is not zero (in dynamic equilibrium state), the equilibrium depth of scour depends slightly on the variations of sediment size. The dynamic equilibrium theory requires that the sediment load passing through a cross section of the upstream end be equal to that of all points along the channel; and the static equilibrium theory requires that the shear stresses on the beds along the channel become the critical shear stresses. (Knapp-USGS)
W73-04754

DEFORMATION OF ALLUVIAL BEDS IN THE CURVES OF RIVERS (DEFORMATION DES LITS ALLUVIONNAIRES DANS LES COUDES DES RIVIERES),
E. Morin.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 127-136, 1972 (release date). 5 fig.

Descriptors: *Channel morphology, *Meanders, *Sedimentary structures, *Bed load, *Hydraulic models, Scour, Stream erosion, Channel erosion, Sediment transport, Sedimentation, Sedimentology, Computer models.

Scale model studies of scours in steep sloping river curves require a complex platform for experiments. This platform includes two circuits: one for water and one for bed load transport. As the discharge increases there are constant changes in the various forms of the channel-bed, including sand waves, ripples, dunes, sandbanks, and plane bed. Data interpretation becomes very difficult. However, by using longitudinal sections along the external wall of the channel, as drawn by computer, and, using envelope curves of maximum scour, results are obtained which may be easily used to produce embankment definition drawings. These results can be expressed by non-dimensional numbers and can be used for determining the position of the scour, its depth in terms of discharge, and the type of embankments. (Knapp-USGS)
W73-04755

FLUVIO-MORPHOLOGIC CONSEQUENCES OF A CONSTRICTION AT THE ENTRANCE TO A RIVER BEND,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
S. Shulits.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 137-144, 1972 (release date). 4 fig.

Descriptors: *Sedimentation, *Meanders, *Construction, *Regime, *Eddies, Deposition (Sediments), Aggradation, Erosion, Ice cover, Rivers, Pennsylvania, Scour, Stream erosion, Bank erosion, Bank stability.
Identifiers: *Susquehanna River.

In the Susquehanna River a jet runway 10,000 ft long was protruded into the river with marked consequences on the river regime. Immediately upstream and downstream from the runway, extensive deposition has moved the shoreline outward. The large-scale eddy zones below caused this deposition. A long eddy zone in the bend below the runway has furthered the growth of existing islands and induced the formation of new ones, forming an island chain. The waters from a left-bank tributary now cling to this bank of the Susquehanna River rather than entering it directly. This course alteration is due to the island chain. The river current has been deflected generally from the left to the right bank. The resultant change in direction of ice flow has produced ice erosion of the banks and numerous islands. These effects are the hydrodynamically predictable results of the eddy zones downstream from the runway. (Knapp-USGS)
W73-04756

INFLUENCE OF BRANCHES OR OF DIVERSIONS ON THE EVOLUTION AND EQUILIBRIUM OF ALLUVIAL BEDS (INFLUENCE DE DERIVATIONS OU DE BIFURCATIONS SUR L'EVOLUTION ET L'EQUILIBRE DE LITS ALLUVIONNAIRES),
G. Morvant.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 145-152, 1972 (release date). 9 fig.

Descriptors: *Alluvial channels, *Channel morphology, *Sediment transport, *Regime, *Diversion, Sedimentation, Sedimentology, Bed load, Model studies, Hydraulic models, Sediment load, Hydraulics.
Identifiers: Medjerda River (Tunisia).

Equilibrium and the evolution of alluvial river beds at branches or diversions depend upon a large number of factors, the main ones being the laws governing fluid flow and sediment transport, the laws governing flow and sediment load distribution between the branches, flow gradients, bed load sediment grain size, and geometry of the junction. Study of the problem, therefore, necessitates the use of a number of equations which enable a certain number of parameters to be defined. Unfortunately, other parameters, such as those concerning sediment load distribution, can be defined only by comparison with known similar conditions or by using data obtained from mobile bed scale model tests. Approaches to solving the problem and methods which may be used to attain the desired result are outlined. Work carried out on the Medjerda River in Tunisia, where the Enchir Tobbias diversion was created to reduce flooding in the lower river reaches, is described. (Knapp-USGS)
W73-04757

ON DOMINANT DISCHARGE CONCEPTS FOR RIVERS,
Technische Hogeschool, Delft (Netherlands).
For primary bibliographic entry see Field 08B.
W73-04758

METHOD FOR CALCULATION OF TOTAL BED-LOAD TRANSPORT AT THE MOUTH OF A RIVER,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
Z. Volf.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 171-174, 1972 (release date). 3 fig.

Descriptors: *Sediment load, *Bed load, *Forecasting, Regime, Alluvial channels, Channel morphology, Hydraulic design, Planning, Sediment discharge, Sediment yield, Statistics, Sediment transport, Sedimentation, Sedimentology.
Identifiers: *Bed load forecasting.

A method of calculation is presented, by which the entire bed-load transport is defined by the river bed capacity for bed load and the probability of appearance of certain hydrologic characteristics at the mouth of the river. On the basis of these calculations, effects which result from changes in the river bed may be forecast. By defining the field of values of the river bed capacity for bed load, the field of conditional probability of appearance of a certain water level for a given discharge, and the probability function of discharge values, it is possible to define the entire bed-load transport. Changes in the entire river bed capacity for bed load can be defined by calculation and indicate changes in the river bed which may be expected after hydraulic works have been completed or other changes of morphological characteristics have taken place. It is possible to draw conclusions concerning the hydrologic conditions which will have the greatest effect on these changes. (Knapp-USGS)
W73-04759

CALCULATION OF RIVER BED DEFORMATION IN UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
M. Miloradov, and D. Muskatirovic.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 175-185, 1972 (release date). 5 fig, 4 ref.

Descriptors: *Channel morphology, *Scour, *Sediment transport, *Alluvial channels, *Mathematical models, Computer programs, Sedimentology, Bed load, Unsteady flow, Regimen, Meanders.

A mathematical model is presented for calculation of deformation of an alluvial river bed with complex cross-section with developed meanders, under conditions of unsteady flow, using an electronic digital computer. Calculation can be carried out separately for unsteady flow and the sediment transport regimen. By using this procedure it is possible to calculate changes of the channel geometry. Basic equations for calculating the unsteady regimen are developed under the basic assumption that the phenomenon may be treated as two-dimensional and that the open channel of complex cross-section affects deformation of the flood wave by the main channel, flood plain, and dead storage areas. Sediment transport is calculated on the basis of hydraulic characteristics of the flow. (Knapp-USGS)
W73-04760

TRANSFORMATION OF DISCONTINUOUS ALLUVIAL WATER COURSES INTO UNIFORM SUBSTITUTE CHANNELS FOR CALCULATING THE SOLID'S DISCHARGE,
Technische Universitaet, Darmstadt (West Germany). Institut fuer Wasserbau und Wasserwirtschaft.
F. Bassler, and W. Schroeder.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 187-192, 1972 (release date). 3 fig, 2 ref.

Descriptors: *Sediment discharge, *Bed load, *Alluvial channels, *Regimen, *Channel morphology, Computer programs, Forecasting, Sediment transport, Sedimentation, Sedimentology.
Identifiers: *Equivalent alluvial channels.

Methods commonly used for determination of the solids discharge of alluvial water courses presume a uniform channel. In order to use them for irregularly formed natural water courses it is necessary to find a uniform equivalent channel with constant bottom width, slope and cross-section. This substitute channel may be calculated using mean values from surveyed profiles. Because the procedure is rather extensive, a computer program is recommended. If there is a gaging station within the surveyed reach, the measurements can directly be referred to the uniform substitute channel, and it will be possible to determine the flow resistances. (Knapp-USGS)
W73-04761

THE INFLUENCE OF AN ISLAND AT THE MOUTH OF A CUTOFF OF A LOOP ON THE DEFORMATION OF THE BED OF WATER COURSE (L'INFLUENCE D'UN ILOT A L'EMBOUCHURE D'UNE COUPURE DE BOUCLE SUR LA DEFORMATION DU LIT D'UN COURS D'EAU).
Robert Coll., Istanbul (Turkey).
For primary bibliographic entry see Field 08B.
W73-04764

A STUDY OF THE OPTIMAL SECTION OF A PILOT CHANNEL FOR A CUTOFF OF A MEANDER (RECHERCHE DE LA SECTION OPTIMALE D'UN CHENAL-PILOTE POUR UNE COUPURE DE MEANDRE)
For primary bibliographic entry see Field 08B.
W73-04765

BED DEFORMATION DUE TO SILTING OF NON-UNIFORM SEDIMENTS IN BACKWATER AFFECTED RIVERS,
Belgrade Univ. (Yugoslavia).
S. Bruk, and V. Miloradov.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 229-238, 1972 (release date). 7 fig, 12 ref.

Descriptors: *Sedimentation, *Backwater, *Bed load, *Suspended load, Sediment transport, Regimen, Sediment load, Sediment discharge, Turbulent flow, Alluvial channels, Particle size, Deposition (Sediments), Silting.
Identifiers: *Danube River.

Alluvial rivers often carry fine sediments in suspension and in strong exchange with the bed material. Bed deformations in such rivers are mainly caused by changing capacity of the flow to transport suspended load. Based on the Barenblatt model of two-phase flow, energy relations were developed for determination of the transport capacity. The effect of nonuniformity of sediment grains was analyzed to yield relationships which can be used for the prediction of the changes of grain-size distribution of suspended load along river reaches affected by backwater. Empirical relationships were found for determination of volume weight of deposited sediments as a function of the grain-size distribution. The study is based on extensive field research on the Danube. (Knapp-USGS)
W73-04766

AN INVESTIGATION OF RIVER BED DEGRADATION DOWNSTREAM OF A DAM,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 08B.
W73-04767

PREDICTION OF RIVER-BED DEGRADATION BELOW DAMS,
Gifu Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04768

DEFORMATION OF ALLUVIAL CHANNEL DOWNSTREAM FROM LARGE HYDRO-PROJECTS,
Universitet Druzhby Narodov, Moscow (USSR).
For primary bibliographic entry see Field 08B.
W73-04769

RIVER-BED DEGRADATION DOWNSTREAM OF DAMS,
State Hydraulic Works, Ankara (Turkey).
For primary bibliographic entry see Field 08B.
W73-04770

EFFECT OF FLOW VARIATION DOWNSTREAM OF A POWER PLANT ON THE BEDLOAD DISCHARGE OF ALLUVIAL RIVERS,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 08B.
W73-04771

ANALYZING LABORATORY MEASUREMENTS OF SCOUR AT CYLINDRICAL PIERS IN SAND BEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 08B.
W73-04773

UNDERMINING NEAR CIRCULAR CYLINDRICAL BRIDGE PILES (AFFOUILLEMENTS AU VOISINAGE DE PILES DE PONT CYLINDRIQUES CIRCULAIRES),
Laboratoire National d'Hydraulique, Chatou (France).

For primary bibliographic entry see Field 08B.
W73-04774

SETTLEMENT OF A CYLINDRICAL BODY PLACED ON THE SURFACE OF AN ALLUVIAL RIVER BOTTOM,
Hydraulic Research Inst., Prague (Czechoslovakia).
For primary bibliographic entry see Field 08B.
W73-04775

SIMILARITY LAWS FOR LOCAL SCOUR WITH SPECIAL EMPHASIS ON VERTICAL CIRCULAR PILE IN OSCILLATORY FLOW,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04776

TIME DEVELOPMENT OF THE DEFORMATION OF AN ALLUVIAL BOTTOM,
Hydraulic Research Inst., Prague (Czechoslovakia).
For primary bibliographic entry see Field 08B.
W73-04777

LOCAL SCOUR AND SCOURING EFFECTS ON SEWER OUTFALLS,
Lund Inst. of Tech. (Sweden).
For primary bibliographic entry see Field 08B.
W73-04778

STUDY OF PROCESSES OF LOCAL UNDERMINING OF HETEROGENEOUS FINE-GRAINED SOILS DOWNSTREAM OF THE BACK APRON OF DIVERSION BARRAGES (ETUDE DU PROCESSUS D'AFFOUILLEMENT LOCAL DES SOLS A GRAINS FINS HETEROGENES A L'ALVAL DES ARRIERE-RADIE RS DES BARRAGES-DEVERSOIRS),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-04779

DEVELOPMENT IN A RIVER OF ARTIFICIAL SALMON POOLS BY USE OF FLOW CONTRACTIONS (DEVELOPPEMENT EN RIVIERE DE FOSSES ARTIFICIELLES A SAUMON A L'AIDE DE CONTRACTIONS DE L'ECOULEMENT),
Cardeau, Inc., Quebec.
For primary bibliographic entry see Field 08I.
W73-04780

STUDY OF LOCAL SCOUR AND KINEMATIC STRUCTURE OF FLOW AROUND SOLID AND THROUGH SPUR-DIKES,
Sredneaziatskii Nauchno-Issledovatelskii Institut Irrigatsii, Tashkent (USSR).
For primary bibliographic entry see Field 08B.
W73-04781

DEFORMATION OF ALLUVIAL BEDS AS A CONSEQUENCE OF THE DISCONTINUANCE OF STRONG FLOWS (DEFORMATION D'UN LIT ALLUVIAL EN CONSEQUENCE D'UNE DISCONTINUITE DES DEBITS SOLIDES),
Slovenska Akademie Ved, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 08B.
W73-04782

RUNOFF, EROSION, AND SOLUTES IN THE LOWER TRUCKEE RIVER, NEVADA, DURING 1969,
Geological Survey, Carson City, Nev.
P. A. Glancy, A. S. Van Denburgh, and S. M. Born.
Water Resources Bulletin, Vol 8, No 6, p 1157-1172, December 1972. 8 fig, 5 tab, 15 ref.

Descriptors: *Water yield, *Sediment yield, *Dissolved solids, *Nevada, Erosion, Runoff, Water chemistry, Hydrogeology, Data collections, Water balance, Sediment transport.
Identifiers: *Truckee River (Nev).

The Truckee River heads in the Sierra Nevada at Lake Tahoe, and terminates in Pyramid Lake. During the 1969 water year, flow about 9 miles upstream from the mouth (974,000 acre-ft) was almost four times the long-term average, due mainly to heavy winter rains and spring snowmelt. A short period of low-altitude rainfall produced the highest concentrations of suspended sediment, whereas a much longer subsequent period of snowmelt yielded a much greater total quantity of material. The upper 90% of the basin yielded about 630,000 tons of sediment at the Nixon gage, whereas an estimated 6.8 million tons was contributed by erosion of about 200 acres of river bank below the gage. Solute content at the gage ranged from 80 to 450 mg/liter, dominated by calcium, sodium, and bicarbonate, plus silica in the most dilute snowmelt and chloride in the most concentrated low flows. Solute load totaled about 130,000 tons, of which the principal constituents in Pyramid Lake--sodium plus equivalent bicarbonate and chloride--amounted to almost 40,000 tons. The total solute load during a year of average flow may be 45,000-55,000 tons, including 18,000-22,000 tons of principal lake constituents. (Knapp-USGS)
W73-04794

SHEETFLOOD STRUCTURE: MECHANISM OF BEACH CUSP FORMATION AND RELATED PHENOMENA,
Herbert H. Lehman Coll., Bronx, N.Y. Dept. of Geology and Geography.
M. A. Gorycki.
Journal of Geology, Vol 81, No 1, p 109-117, January 1973. 7 fig, 26 ref.

Descriptors: *Beach erosion, *Geomorphology, *Sheet erosion, *Sheet floods, Sand waves, Topography, Sedimentary structures, Overland flow, Surf, Waves (Water), Sediment transport, Rip currents.
Identifiers: *Beach cusps.

Experimental evidence suggests that breaking waves and swash can become structured into salients separated by turbulent zones of retarded flow and may be responsible for the formation of regularly spaced beach cusps. The mechanism involved is initiated by the tendency of the edge of fluids traversing flat surfaces to extend laterally and invaginate at regularly spaced intervals; its operations is compatible with several prior theories and observations of beach cusp formation. The mechanism apparently operates in other geological situations. Longitudinal, evenly spaced strips of sand deposited underwater on the floors of flumes, and on a larger scale on the sea bottom, may also be the result of sheetflood structure developing after a critical water velocity has been reached. The same process acting in the atmosphere may be responsible for the growth of regularly spaced parabolic, longitudinal, and seif dunes and sand strips in desert regions. (Knapp-USGS)
W73-04797

THREE DIMENSIONAL BEACH CHANGES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
C. J. Sonu.
Journal of Geology, Vol 81, No 1, p 42-64, January 1973. 14 fig, 2 tab, 50 ref. NR 388-002, ONR-GP Contract N00014-69-A-0211-0003.

Descriptors: *Beaches, *Sand waves, *Sedimentary structures, *Seiches, Topography, Geomorphology, Surf, Littoral drift, Currents (Water), Waves (Water), Sediment transport, Profiles, Beach eroision.

Beach forms, such as crescentic bars and cuspate shoreline, manifest a three-dimensional structure characterized by periodic longshore undulations of both the surf zone bed and the subaerial surface. The three-dimensional structure and the tendency for migration of rhythmic topography cause distinctive modes of beach change. Since crescentic outer bars tend to migrate parallel to shore, profile changes involving an outer-bar system generally reflect two unrelated processes, one arising from net transformation of individual profiles and the other from longshore displacement of a whole rhythmic system in response to currents. Crescentic inner bars exhibit a tendency for predominant shoreward migration during the time of swells. Under this condition, a subaerial beach will initially assume a ridge-and-runnel-type structure and eventually a uniform two-dimensional profile when full accretion is reached Beach changes involving crescentic inner bars can produce a beach cycle length, which agrees with the field observation. Crescentic bars forming between headlands appear to be generated by a standing edge wave continuously excited by an incident seiche of beat frequency, whereas rhythmic topographies on an unbounded coast appear to be caused by sand-wave trains which result from instability of the surf zone bed perturbed by longshore currents and waves. (Knapp-USGS)
W73-04798

THE INCLINATION OF TALUS, ARCTIC TALUS TERRACES, AND OTHER SLOPES COMPOSED OF GRANULAR MATERIALS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
R. J. Chandler.
Journal of Geology, Vol 81, No 1, p 1-14, January 1973. 9 fig, 2 tab, 30 ref.

Descriptors: *Slopes, *Talus, *Arctic, *Degradation (Slope), Permafrost, Frozen ground, Geomorphology, Erosion, Mass wasting, Weathering, Particle size, Sediment transport, Sedimentation.
Identifiers: Spitsbergen.

The minimum angle of shearing resistance of most materials composing talus slopes is about 39-40 def. The assumption that the typical 35 deg inclination of well-drained talus slopes reflects the shearing resistance of the talus material is therefore incorrect. The inclination of well-drained talus slopes will reflect the angle of shearing resistance only if (1) the slopes are being rapidly eroded, or (2) deposition rates are high compared with the degradation rates resulting from processes on the talus slope. In both instances, the slope angles will generally be 39 deg or steeper. This suggestion is supported by laboratory shear-test data from some Spitsbergen talus terraces which have eroded, and consequently relatively steep (up to 39 deg), outer slopes. Further support is provided by a number of observations reported in the literature. Shallow landslips sometimes occur on these and other 'granular' slopes in Spitsbergen at angles considerably less steep than 39-40 deg. This appears to be the result of impeded drainage due to the presence of permafrost at a shallow depth. A further observation suggests that average degradation rates over the past 10,000 years for the faces of two Spitsbergen talus terraces originally steepened by marine erosion are about 0.3 deg per 1,000 years. (Knapp-USGS)
W73-04800

THERMOMAGNETIC BEHAVIOR OF MANGANESE NODULES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W73-04801

RATIO MATCHING--A STATISTICAL AID FOR DISCOVERING GENERIC RELATIONSHIPS AMONG SAMPLES,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05A.
W73-04827

PESTICIDES AND HEAVY METALS IN THE AQUATIC ENVIRONMENT,
Iowa Univ., Iowa City. State Hygienic Lab.
For primary bibliographic entry see Field 05B.
W73-04854

SEDIMENT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05B.
W73-04896

IOWA PASSES EROSION-CONTROL LAW,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 06E.
W73-04905

GRADED ROWS FOR THE CONTROL OF RILL EROSION,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04D.
W73-04979

PREDICTION OF SEDIMENT YIELDS FROM SMALL WATERSHEDS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
For primary bibliographic entry see Field 04D.
W73-04980

SILT TRANSPORT BY THIN FILM FLOW,
Queensland Inst. of Tech., Darling Downs, Toowoomba (Australia).
T. H. Podmore, and G. E. Merva.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 6, p 1065-1072, June 1971. 6 fig, 2 tab, 15 ref.

Descriptors: *Erosion, *Soil conservation, Water pollution sources, Sheet erosion, Silts.

The study was made to obtain information on intermediate stages of the erosion process involving the transport of eroded materials by thin film flow. The use of Stokes Law as a model for the sedimentation process leading to deposition of suspended material was inadequate. A 'Critical Distance' was defined as the distance from the point of insertion of sediment in the flowing film to the point at which a maximum amount of material is deposited for a predetermined particle size range. A Coulter Counter was used to analyze small amounts of suspended material. It was concluded that: (1) Critical Distance is generally independent of particle size. (2) Critical Distance decreases with increasing surface roughness. (3) Critical Distance generally increases with increasing slope. (4) Stokes Law does not yield a satisfactory model of the sediment transport mechanism. (5) The Coulter Counter can be utilized for particle size analysis of small amounts of suspended silt. (Skogerboe-Colorado State)
W73-04997

RECENT SEDIMENTS OF THE CENTRAL CALIFORNIA CONTINENTAL SHELF, PILLAR POINT TO PIGEON POINT: PART A. INTRODUCTION AND GRAIN SIZE DATA,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 02L.
W73-05103

SOME CHARACTERISTICS OF YOUNG SEDIMENTS ALONG THE COAST BORDERING THE DUTCH WADDEN SHALLOWS,
IJsselmeerpolders Development Authority, Kampen (Netherlands). Biology Lab.
For primary bibliographic entry see Field 02L.
W73-05107

ON THE ROLE OF BACTERIA AND SEDIMENT IN THE MATERIAL BALANCE OF LAKES,
Wasserwirtschaftsdir ektion Mittlere Elbe-Sude-Elde, Magdeburg (East Germany).
For primary bibliographic entry see Field 05C.
W73-05112

2K. Chemical Processes

AN ELECTROCHEMICAL METHOD FOR THE DETERMINATION OF TRACE AMOUNTS OF PHOSPHATE IN NATURAL WATER,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 05A.
W73-04627

REDOX POTENTIALS BY EQUILIBRATION,
Queen's Univ., Kingston (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04641

COLLABORATIVE STUDY OF THE OFFICIAL AOAC FLAME PHOTOMETRIC METHOD FOR THE DETERMINATION OF SODIUM IN FERTILIZERS,
For primary bibliographic entry see Field 05A.
W73-04647

COLLABORATIVE STUDY OF AN AUTOMATED METHOD FOR PHOSPHORUS IN FERTILIZERS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development.
For primary bibliographic entry see Field 05A.
W73-04648

CONFIRMATION OF PESTICIDE RESIDUE IDENTITY, PART III. DERIVATIVE FORMATION IN SOLID MATRIX FOR THE CONFORMATION OF ENDRIN BY GAS CHROMATOGRAPH,
Department of the Environment, Burlington (Ontario). Water Quality Div.
For primary bibliographic entry see Field 05A.
W73-04651

ENVIRONMENTAL SCIENCE LABORATORY MANUAL,
For primary bibliographic entry see Field 05A.
W73-04654

OBSERVATIONS ON THE CHEMICAL NATURE OF THE WATER OF THE TULEAR REGION: DIVERSITY, VARIATIONS, RELATIONS TO THE BIOCENOTIC ZONATION (IN FRENCH),
H. Weiss, and A. Kiener.
Tethys Suppl. 1. p 215-235. 1971. Illus. English summary.
Identifiers: *Biocenotic zonation, Chemical analysis, Diversity, Fauna, Flora, *Madagascar, *Salinity, Tulear region, Zonation.

Data are given of several analyses of waters gathered in the region of Tulear (Madagascar), in mangrove-swamps and neighboring zones. They show diversity and correlation between variations of salinity and localization of some elements of the flora and fauna.--Copyright 1972, Biological Abstracts, Inc.
W73-04673

RESPONSE OF A CALCIUM-SELECTIVE ELECTRODE IN ACID SOLUTIONS,
Melbourne Univ., Parkville (Australia). Dept. of Industrial Science.
For primary bibliographic entry see Field 05A.
W73-04681

TECHNIQUE FOR CHEMICAL IONIZATION OPERATION OF A CEC 21-110B MASS SPECTROMETER,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
For primary bibliographic entry see Field 07B.
W73-04684

SUCCESSIVE PHOTOMETRIC TITRATION OF CALCIUM AND MAGNESIUM,
Yokohama National Univ. (Japan). Lab. for Industrial Analytical Chemistry.
For primary bibliographic entry see Field 05A.
W73-04686

STRUCTURAL DETERMINATION OF MONOSUBSTITUTED ALKYLBENZENES BY PROTON MAGNETIC RESONANCE,
Government Chemical Industrial Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 05A.
W73-04687

DETERMINATION OF CHROMIUM IN BIOLOGICAL MATERIALS BY ATOMIC ABSORPTION SPECTROMETRY USING A GRAPHITE FURNACE ATOMIZER,
Bowman Gray School of Medicine, Winston-Salem, N.C.
For primary bibliographic entry see Field 05A.
W73-04688

RAPID, PHASE-SENSITIVE, THREE-ELECTRODE ALTERNATING CURRENT POLAROGRAPHY,
Melbourne Univ., Parkville (Australia). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 05A.
W73-04689

ULTRASONIC NEBULIZATION IN A LOW--EMISSION FLAME FOR ATOMIC FLUORESCENCE SPECTROMETRY,
Illinois Univ., Chicago. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04690

DETECTION LIMITS IN ANALYSIS OF METALS IN BIOLOGICAL MATERIALS BY LASER MICROPROBE OPTICAL EMISSION SPECTROMETRY,
Stanford Univ., Calif. Dept. of Pathology.
For primary bibliographic entry see Field 05A.
W73-04691

DETERMINATION OF ALUMINUM IN BIOLOGICAL MATERIAL BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Toronto Univ. (Ontario). Dept. of Medicine; and Toronto Univ. (Ontario). Dept. of Physiology.
For primary bibliographic entry see Field 05A.
W73-04701

THERMOMAGNETIC BEHAVIOR OF MANGANESE NODULES,
Washington Univ., Seattle. Dept. of Oceanography.
R. Carpenter, H. P. Johnson, and E. S. Twiss.

Journal of Geophysical Research, Vol 77, No 36, p 7163-7174, December 20, 1972. 3 fig, 1 tab, 22 ref. NSF Grant 30538.

Descriptors: *Iron, *Iron oxides, *Manganese, *Bottom sediments, *Magnetic studies, Water chemistry, Sedimentology, Chemical reactions, Thermodynamics, Oxides, Oxidation.
Identifiers: *Thermomagnetic behavior.

Strong field magnetization was determined as a function of temperature for over 50 marine and fresh-water ferromanganese nodules to define the forms in which iron is present. Both marine and fresh-water nodules have 0.1-0.5 emu/g at 20 deg C in a 7.2-koe field, corresponding to upper limits of 0.1-0.6% of magnetite or maghemite in particles larger than superparamagnetic. Hysteresis loops at 20 deg C show the presence of small and varying amounts of ferrimagnetic components in the predominately paramagnetic nodules. When the deep sea nodules are heated to 700 deg C, the dominant changes are characteristic either of paramagnetic phases alone or of paramagnetic phases plus a material with 580 deg C Curie point. When they are cooled from 700 deg back to 20 deg C, the deep sea nodules show a large increase in magnetization, the Curie point being 100-200 deg C. This behavior is due to the partial conversion of the initial Fe and Mn oxides and oxyhydroxides to jacobsites (Fe, Mn)3 04. Six of the seven fresh-water nodules behaved quite differently on heating in air, showing a large bump in the heating curve and 580 deg C Curie points on cooling. This type of behavior cannot now be adequately explained. (K-napp-USGS)
W73-04801

PRODUCTION OF CARBON MONOXIDE IN RAIN WATER,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
I. E. Galbally.
Journal of Geophysical Research, Vol 77, No 36, p 7129-7132, December 20, 1972. 2 tab, 16 ref.

Descriptors: *Rain water, *Water chemistry, *Carbon, *Chemical reactions, Organic matter, Raindrops.
Identifiers: *Carbon monoxide, *Photolysis, Photodissociation, Aldehydes.

The observed carbon monoxide supersaturation in rainwater may be a product of the photodecomposition of aldehydes in the rainwater by sunlight. A hynamic model of this carbon monoxide production successfully predicts the observed daytime supersaturation levels. However, the nighttime supersaturation remains unexplained. The relevance of the suggested production mechanism to carbon monoxide supersaturation observed in ocean surface waters is discussed. (Knapp-USGS)
W73-04802

THE VARIABILITY OF OCEANOGRAPHIC OBSERVATIONS OFF THE COAST OF NORTH-WEST AFRICA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 05A.
W73-04821

AUTOMATED REACTION-RATE METHODS OF ANALYSIS,
Illinois Univ., Urbana. Roger Admas Lab.
For primary bibliographic entry see Field 07B.
W73-04825

COMPUTER CONTROLLED STROPPED-FLOW STUDIES - APPLICATION TO SIMULTANEOUS KINETIC ANALYSES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04828

CONVERSATIONAL MASS SPECTRAL RETRIEVAL SYSTEM AND ITS USE AS AN AID IN STRUCTURE DETERMINATION,
National Institutes of Health, Bethesda, Md. Div. of Computer Research and Technology.
S. R. Heller.
Analytical Chemistry, Vol 44, No 12, p 1951-1961, October 1972. 11 fig, 9 tab, 17 ref.

Descriptors: *Data storage and retrieval, *Design criteria, Automation, Computers, Computer programs, Control systems, Pollutant identification, Physical properties.
Identifiers: *Mass spectra, Molecular weight, Chemical structure, Molecular structure, Data acquisition, Data interpretation.

An interactive, conversational mass spectral retrieval system consisting of a collection of computer programs designed to give immediate retrieval of mass spectral data is described. The system options include a peak/intensity search, a molecular weight search, a complete molecular formula search, an imbedded molecular formula search, and printout of the peaks and intensities of the entire spectrum. The programs used to generate and search the files, as well as the file structure, are described. (Byrd-Battelle)
W73-04829

COMPUTER ACQUISITION AND ANALYSIS OF GAS CHROMATOGRAPHIC DATA,
American Cyanamid Co., Stamford, Conn. Central Research Div. Labs.
For primary bibliographic entry see Field 07C.
W73-04830

MAXIMIZATION OF SENSITIVITIES IN TANTALUM RIBBON FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Instrumentation Lab., Inc., Lexington, Mass.
For primary bibliographic entry see Field 05A.
W73-04833

REDUCTION OF A MATRIX EFFECT IN SPARK SOURCE MASS SPECTROMETRY USING A SOLUTION DOPING TECHNIQUE,
Kennecott Copper Corp., Lexington, Mass. Ledgemont Lab.
For primary bibliographic entry see Field 05A.
W73-04834

PRODUCTION AND ANALYSIS OF SPECIAL HIGH-PURITY ACIDS PURIFIED BY SUB-BOILING DISTILLATION,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 05A.
W73-04835

USE OF THE MICROWAVE-EXCITED EMISSIVE DETECTOR FOR GAS CHROMATOGRAPHY FOR QUANTITATIVE MEASUREMENT OF INTER-ELEMENT RATIOS,
Imperial Coll. of Science and Technology. London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04836

GELATIN AS A MATRIX FOR A MERCURY REFERENCE MATERIAL,
Eastman Kodak Co., Rochester, N.Y. Industrial Lab.
For primary bibliographic entry see Field 05A.
W73-04840

A SIMPLE COMPUTER-SPECTROPHOTOMETER INTERFACE,
Wake Forest Univ., Winston-Salem, N.C. Dept. of Physics.
For primary bibliographic entry see Field 07C.
W73-04859

COMPOSITE DILATOMETER FOR MEASURING DENSITY OF LIQUIDS AND SOLIDS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
For primary bibliographic entry see Field 07B.
W73-04860

CHEMICAL ANALYSES OF SUSPENDED PARTICULATE MATTER COLLECTED IN THE NORTHEAST ATLANTIC,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
For primary bibliographic entry see Field 05A.
W73-04866

RELATIONSHIP BETWEEN ATMOSPHERIC CARBON DIOXIDE AMOUNT AND PROPERTIES OF THE SEA,
Texas A and M Univ., College Station. Dept. of Physics.
G. N. Plass.
Environmental Science and Technology, Vol 6, No 8, p 736-740, August 1972. 7 fig, 13 ref.

Descriptors: *Carbon dioxide, *Atmosphere, *Sediments, *Sea water, *Equilibrium, *Calcium carbonate, *Chemical precipitation, Air-water interfaces, Boundary processes, Water properties, Bottom sediments, Clays, Volume, Inorganic compounds, Chemical reactions, Water temperature, Mathematical studies, Climatology.
Identifiers: Climatic changes.

The variation of the atmospheric CO2 amount with the properties of the sea is obtained from numerical solution of the equilibrium equations. Solutions are given when: there is insufficient time for equilibrium with either CaCO3 deposits or the clay sediments; there is sufficient time for equilibrium with the CaCO3 deposits, but not with the clay sediments; and the time is sufficiently long for equilibrium with both CaCO3 deposits and the clay sediments. The variation of the partial pressure of the atmospheric CO2 is shown as a function of the toal CO2 in the sea and atmosphere, the mean temperature of the sea, and the volume of the sea. The implications for theories of climatic change are discussed. (Snyder-Battelle)
W73-04887

THE MEASUREMENT AND MECHANISM OF ION DIFFUSION IN SOILS VI. THE EFFECT OF CONCENTRATION AND MOISTURE CONTENT ON THE COUNTER-DIFFUSION OF SOIL PHOSPHATE AGAINST CHLORIDE ION,
School of Agriculture, Aberdeen (Scotland). Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 02G.
W73-04930

COMPONENTS OF PH DEPENDENT CATION EXCHANGE CAPACITY,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 02G.
W73-04959

MOVEMENT OF SALT AND WATER NEAR CRYSTALLINE SALT IN RELATIVELY DRY SOIL,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 02G.
W73-04960

A COMPARISON OF METHODS FOR THE DETERMINATION OF SOIL ORGANIC PHOSPHOROUS,
Lincoln Coll. (New Zealand).
For primary bibliographic entry see Field 02G.
W73-04962

A STUDY ON DRINKING WATER IN VILLAGE RAHIMABAD OF LUCKNOW DISTRICT,
King George's Medical Coll., Lucknow (India). Dept. of Social and Preventive Medicine.
For primary bibliographic entry see Field 05B.
W73-05079

THE NITROGEN GAIN OF FOREST ECOSYSTEMS FROM PRECIPITATION (IN GERMAN),
Standortslehre Forstlichen Forschungsanstalt, (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 04A.
W73-05080

GROUND WATER IN THE HALLANDALE AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W73-05092

HYDROLOGY OF CHANNEL-FILL DEPOSITS NEAR SALISBURY, MARYLAND AS DETERMINED BY A 30-DAY PUMPING TEST,
Maryland Geological Survey, Annapolis.
For primary bibliographic entry see Field 04B.
W73-05109

EXPLORATION AND MAPPING OF SALISBURY PALEOCHANNEL, WICOMICO COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W73-05110

CHEMICAL PROPERTIES OF THE PRETO DA EVA RIVER, AMAZON: A PRELIMINARY STUDY, (IN PORTUGUESE),
Instituto Nacional de Pesquisas da Amazonia, Manaus (Brazil).
For primary bibliographic entry see Field 05A.
W73-05115

ANALYSIS OF LEACHED WATERS UNDER CONTROLLED CONDITIONS (IN SPANISH),
Instituto de Investigaciones Geologicas, Edafologicas y Agrobiologicas de Galicia, Santiago (Spain).
F. Guitian Ojea, P. Rodriguez Seoane, and Viqueira F. Diaz-Fierros.
An Edafol Agrobiol. Vol 30, No 3/4, p 323-346. 1971. Illus. English summary.
Identifiers: Controlled conditions, *Leached waters, *Minerals, *Water analysis.

Leaching in 1968-1969 (1535 mm) was greater than the annual average 828 mm. This surplus occurs once every 25 yr. The amount of Ca2+ washed from the soil was 22-25 gr/m2 and most of it came from the added CaNO3. There was a maximum of washed Ca2+ at 300 mm of percolation. The washed Mg2+ followed the same pattern as Ca2+, with the relation Ca/Mg ± 3. Leached K+ followed a progressively decreasing pattern, the total amount being 11-17 gr/m2. The behavior of PO43+ was irregular; the total amount washed was 25-50 mg/m2. N was lost as NO3- and was completely washed with 700 mm of leaching having a maximum at 250 mm. It was a 1st-order chemical reaction.--Copyright 1972, Biological Abstracts, Inc.
W73-05175

A HUMMOCK OF SPAGNUM: AN EXAMPLE OF A NATURAL ION-EXCHANGING COLUMN (IN GERMAN),
Kiel Univ. (West Germany). Botanisches Institut.
For primary bibliographic entry see Field 02I.
W73-05192

2L. Estuaries

LARVAE OF DEEP-SEA FISHES (STOMIATOIDEA) FROM BISCAYNE BAY, FLORIDA, USA, AND THEIR ECOLOGICAL SIGNIFICANCE,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
D. P. De Sylva, and L. N. Scotton.
Marine Biology, Vol 12, No 2, p 122-128, January 1972. 3 fig, 1 tab, 26 ref. EPA FWQA 18050 DIU.

Descriptors: Fish, *Bays, *Sewage effluents, *Indicators, Recycling, Environmental effects, Tides, Winds, Currents, *Florida.
Identifiers: *Biscayne Bay, *Fish larvae, Bathophilus, Stomias, Cyclothone.

A long-term, comprehensive study of the larval fishes found in Biscayne Bay and adjacent waters was undertaken in 1969. The purpose is to establish which fish species normally occur in the Bay as larvae and under what ecological conditions. The larvae of 51 teleost fish families currently identified in the Bay have typically been found in estuarine, coastal, or coral-reef habitats. However, twenty stomiatoid fish larvae (3.1 to 21.9 mm) belonging to the genera Bathophilus, Cyclothone, and Stomias were also collected. The adults of these three fish families are mesopelagic (200 to 1000 m deep) in the open ocean. It is presumed that these larvae were advected in parcels of high salinity water into the shallows of Biscayne Bay by winds, tides, or currents. The presence of these larvae imply that sewage discharged into the Florida Current is recycling into coastal waters, as well as into the Bay. It is further suggested that oceanic fish larvae may prove to be good indicators of recycling wastes. (Ensign-PAI)
W73-04608

SCIENTIFIC AND TECHNICAL ASPECTS OF THE CONTROL OF COASTAL POLLUTION.
For primary bibliographic entry see Field 05G.
W73-04615

MIXING MODEL PREDICTION OF FLUORIDE DISTRIBUTION IN CHESAPEAKE BAY,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-04621

FATTY-ACID ECOLOGY OF A TIDAL MARSH,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05B.
W73-04655

DISTRIBUTION OR ORGANIC CARBON IN A GLACIAL ESTUARY IN ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W73-04658

SOME ASPECTS OF THE BIOLOGY OF GAMMARELLUS HOMARI (CRUSTACEA, AMPHIPODA) IN THE NORTHWESTERN ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
D. H. Steele.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1340-1343, September 1972. 1 fig, 2 tab, 8 ref.

Descriptors: *Systematics, *Distribution patterns, Growth stages, Crustaceans, Atlantic Ocean, Invertebrates, Ecology, Amphipoda.
Identifiers: *Gammarellus homari, Macroinvertebrates.

Gammarellus homari is a sublittoral Atlantic amphipod found from eastern Newfoundland and the northern Gulf of St. Lawrence north to Ellesmere Island. It is distinguished from G. angulosus by its larger size, smaller eyes and when alive by its red coloration. It appears to produce a single brood of young per year. Ovigerous females are found at depths of 12-15 m in the winter and the young are released in late winter or spring. It is not known where the males occur or where the adult females spend the remainder of the year. (Little-Battelle)
W73-04706

BENTHOS TRAPPED LEAVING THE BOTTOM IN BIDEFORD RIVER, PRINCE EDWARD ISLAND,
Bedford Inst., Dartmouth (Nova Scotia).
M. L. H. Thomas, and E. Jelley.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1234-1237, August 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Benthos, *Estuarine environment, *Diurnal distribution, Crustaceans, Benthic fauna, Invertebrates, Vertical migration, Biomass, Animal behavior , Trapping, Annelids, Zooplankton, Sampling.
Identifiers: *Funnel traps, *Bideford River (P.E.I.), Polychaetes, Nemerteans, Species diversity, Cerebratulus lacteus, Eteone lactea, Glycera dibranchiate, Nereis succinea, Nereis virens, Pherusa affinis, Scoloplos fragilis, Ampelisca vadorum, Ampithoe rubricata, Argulus, Carinogrammarus mucronatus, Corophium insidiosum, Crangon septemspinosus, Gammarus, Mysis stenolepis Neomysis americana, Neopanope texana, Oxyurostylis smithii, Palaemonetes vulgaris.

Inverted funnel traps, designed to catch animals swimming up from the bottom, set in Bideford River estuary, P.E.I., during the summer of 1969 caught numerous benthic and hyperbenthic invertebrates. The funnels were of transparent vinyl sheet supported on a frame of 1/4-inch (6-mm) iron rod. The apex of each funnel was constructed from a transparent plastic funnel cut to leave an opening 1 cm in diameter. The opening discharged into a 500 ml glass jar, whose plastic top was cut to fit around the funnel and glued to it. The jar also communicated with the interior of the funnel through two openings screened with 0.5-mm mesh. This allowed some water to leave the collecting jar when it was hauled, while air entered through the funnel apex, thus reducing specimen loss. Five traps were usually set simultaneously in water less than 1.5 m deep and bedded in by hand; in deeper water they were lowered slowly on ropes. Eighteen sets of traps were out only during daylight and 19 were out predominantly at night. Catches were sorted alive and only swimming species considered. Each species was counted and weighed with surface water removed. Occasional samples were decalcified where appropriate and reweighed after drying in a forced air oven at 100 C to estimate the approximate dry organic matter. Many crustaceans generally considered to be planktonic appeared to enter the substratum during the day and to leave it at night. Several polychaetes, some of which were not known to swim, were regularly collected. The average catch per square meter per day was 23 individuals, amounting to 0.08 g (decalcified dry weight). (Holoman-Battelle)
W73-04727

ON THE FORMATION OF DUNES AND MEANDERS,
Queens Univ., Kingston (Ontario).
For primary bibliographic entry see Field 02J.
W73-04753

WATER QUALITY CONDITIONS IN THE CHESAPEAKE BAY SYSTEM,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05A.
W73-04784

GROUND-SURFACE WATER INTERACTION IN THE LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Thermal and Fluid Sciences Center.
For primary bibliographic entry see Field 02F.
W73-04788

THE CONCEPT OF SAFE GROUNDWATER YIELD IN COASTAL AQUIFERS,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Water Resources Bulletin, Vol 8, No 6, p 1173-1176, December 1972. 19 ref.

Descriptors: *Safe yield, *Water management (Applied), Artificial recharge, Waste disposal wells, Saline water intrusion, Environmental effects, Estuaries, Surface-groundwater relationships, Hydrogeology.
Identifiers: *Coastal aquifers.

The traditional factors used to determine safe yield of a groundwater basin (water supply, economics, water quality and water rights) do not include environmental effects. Because of the unique estuarine ecosystems associated with many coastal aquifers, environmental effects should be included in the determination of the safe yield of these aquifers. Controlled saline-water intrusion should be considered as a management tool in coastal aquifers. Artificial aquifer recharge using treated wastewater may be used to increase the safe yield of a coastal aquifer system while preserving the coastal ecosystems. (Knapp-USGS)
W73-04793

PROCESSES OF CHANNEL DEVELOPMENT IN A HIGH-TIDE-RANGE ENVIRONMENT: CAMBRIDGE GULF-ORD RIVER DELTA, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, J. M. Coleman, and B. G. Thom.
Journal of Geology, Vol 81, No 1, p 15-41, January 1973. 17 fig, 3 tab, 24 ref. NR 388 002, ONR-GP Contract N00014-69-A-0211-0003.

Descriptors: *Channel morphology, *Rivers, *Tidal streams, Deltas, Tidal effects, Tidal waters, Tides, Geomorphology, Meanders, Sediment transport, Tidal bores, Waves (Water), Water level fluctuations, *Australia.
Identifiers: *Ord River.

The lower Ord River of Western Australia has a tidal range of 5.9 m at its mouth and has a typical 'funnel-shaped' or exponentially converging form. The tide within the lower Ord behaves as a standing wave, and tidal amplitude decreases at a cosine rate from a maximum at the mouth to zero over a distance which corresponds to one-quarter tidal wavelength. The point of zero amplitude corresponds to the upstream limit of tidal influence and to the point at which channel convergence ceases. Because of the cosine variation in amplitude, the tidal prism decreases upstream at a nonlinear rate. Depth and width convergence rates tend to balance frictional dissipation and produce a condition of equal work per unit area of channel bed by coadjusting with tidal prism. Bedload transport patterns and an upstream increase in sinuosity are attributable to an upstream increase in tide wave asymmetry. In contract to the Ord, the King River, located within the same region and dynamic environment, is highly sinuous and has parallel banks and a low width/depth ratio. The tide in this channel is similar to a progressive wave. Correspondingly, amplitude is constant from the mouth to a point only a short distance downstream from the limit of tidal influence; the tidal prism decreases at a constant linear rate. This situation seems to be attributable to a low value for the ratio of channel length to tidal wavelength. (Knapp-USGS)
W73-04799

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons, Brinckeroff, Quade and Douglas, Inc., Denver, Colo.
For primary bibliographic entry see Field 05F.
W73-05054

RECENT SEDIMENTS OF THE CENTRAL CALIFORNIA CONTINENTAL SHELF, PILLAR POINT TO PIGEON POINT: PART A. INTRODUCTION AND GRAIN SIZE DATA,
California Univ., Berkeley. Coll. of Engineering.
T. Yancey, C. Isselhardt, L. Osuch, J. Lee, and P. Wilde.
Available from NTIS, Springfield, Va. 22151 as AD-709 628, Price $3.00 printed copy; 95 cents microfiche. California University Hydraulic Engineering Laboratory Technical Report HEL-2-26, July, 1970. 64 p, 5 fig, 5 ref.

Descriptors: *Sedimentology, *Coasts, *Continental shelf, *California, Data collections, Bottom sampling, Particle size, Tidal waters, Sampling, Methodology, Sieve analysis, Sediments, Sands.
Identifiers: *Pillar Point (Calif), *Pigeon Point (Calif).

Data are presented for a study of the sediments and sedimentary processes of the continental shelf of central California done in cooperation between the University of California, Berkeley, and the Coastal Engineering Research Center, U.S. Army Corps of Engineers. Included are 43 marine samples and 9 intertidal beach samples taken specifically for this project, and 28 marine samples from a previous study. Marine bottom samples were obtained with an orange peel grab sampler from a boat during August 1968. Marine samples were obtained from the shoreline to 240 feet below sea level. Intertidal beach samples were obtained in April 1970. The calculated statistical parameters plus median size are plotted uncontoured on the basemap as median grain size, sorting coefficient, skewness, and kurtosis. (Woodard-USGS)
W73-05103

LONG SHORE CURRENTS AND WAVE STATISTICS IN THE SURF ZONE,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 02E.
W73-05104

SOME CHARACTERISTICS OF YOUNG SEDIMENTS ALONG THE COAST BORDERING THE DUTCH WADDEN SHALLOWS,
IJsselmeerpolders Development Authority, Kampen (Netherlands). Biology Lab.
J. Hofstee.
Soil Science, Vol 113, No 6, p 386-393, June, 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Sedimentology, *Bottom sediments, *Mud, *Water chemistry, Organic matter, Sodium, Salinity, Magnesium, Calcium, Ammonia, Sulfates, Sulfides, Adsorption, Sedimentation.
Identifiers: Wadden (Netherlands).

The chemical composition of very young Dutch Wadden sediments differs considerably from that of young Lake IJssel sediment. Per 100 g soil it contains some 300% more sodium, 400% more magnesium, 90% less calcium, and 95% less ammonium adsorbed; 250% more soluble sulfates and 50% more sulfides. The lime and humus content are respectively about 15% and 50% higher. Drying of the material causes a rise in the adsorptive capacity of nearly 15%. Most of the differences observed were due to the different conditions in the two locations. (Knapp-USGS)
W73-05107

TIDAL CYCLE STUDIES IN RELATION TO ZOOPLANKTON DISTRIBUTION IN THE GODAVARI ESTUARY,
Andra Univ. (India). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-05119

HYDROBIOLOGICAL STUDIES OF THE SALT WATERS OF BELGIUM: XI. STUDY OF MARITIME BASIN IN THE OSTENDE PORT: B. PLANKTON STUDY: C. CONCLUSIONS,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
L. VanMeel.
Bull Inst Roy Sci Natur Belg. Vol 45, No 12, p 1-62, 1969.
Identifiers: Asterionella-Japnica, Basin, *Belgium, Biddulphia-Sinensis, C, Chaetoceras-Didymus, Dominants, Hydrobiological studies, Ostende, Periodicity, *Plankton, Prorocentrum-Micans, Rhizosolenia-Spp, Salt waters, Scenedesmus-Quadricauda, Seasonal, Skeletonema-Costatum.

The general characteristics of the phytoplankton, population composition (Bacillario-phyceae 51.62%, Dinophyceae 32.09%) and germination in species such as Skeletonema costatum, Prorocentrum micans, Peridinium triquetrum, Pyramimonas octociliata were studied. The habitual presence of some Chlorophyta, supposedly freshwater, such as Scenedesmus quadricauda, was observed. The associations noted include Triposplankton and Styliplankton from oceanic species; Didymusplankton and Neriton meridionale, Neriton septentrionale and Concinnusplankton, all 3 belonging to neritic plankton. Often these associations are present only in fragments. The percentage of phytoplankton concentration and its distribution throughout the year was also determined, as well as the periodicity of plankton species (occurrence per month, relative rareness of species, occurrence per season), Dominant species were Skeletonema costatum, Rhizosolenia stolterfothii, R. setigera, Chaetoceras didymus, Biddulphia sinensis, Asterionella japonica, Prorocentrum micans and Scenedesmus quadricauda, which were present throughout the year.--Copyright 1972, Biological Abstracts, Inc.
W73-05153

REMARKS ON THE ROLE OF CHAROPHYTA IN MARGINO-LITTORAL ENVIRONMENTS,
Paris Univ. (France). Laboratoire d'Histologie.
A. Levy, and G. Lucas.
C R Hebd Seances Acad Sci Ser D Sci Natur (Paris). Vol 272, No 20, p 2527-2530, 1971, Maps.
Identifiers: Acetabularia mediterranea, Calcium, Chara aspersa var marina, *Charophyta, Environments, Ions, Lamprothamnion papulosum, *Margino-littoral, *Algae.

In the Gulf of Lion, 3 types of populations were differentiated: slightly salty water with Chara aspersa var. marina, Lamprothamnium papulosum, Acetabularia mediterranea; freshwater in regions of salt water, with Chara aspersa var. marina, which disappears rapidly on contact with the salty surface; marshy zones bordering lagoons and salt pools, with no Charophytes, except for

disseminated oogonia in the deposits. Other factors may have an influence, such as the ions dissolved in the water (i.e., increase in Ca salts resulting from the decomposition of calciphilic species); many Charophytes play a regulating role on the Ca level.--Copyright 1972, Biological Abstracts, Inc.
W73-05161

THE VEGETATION OF THE LITTORAL BELT AND LAGOONS OF CAPE PALMAS (LIBERIA) (IN FRENCH),
Museum Natioal d'Histoire Naturelle, Paris (France).
J. G. Adam.
Bull Soc Bot Fr, Vol 117, No 7/8, p 419-427. 1970. Illus. English summary.
Identifiers: Cape, Lagoons, *Liberia, Littoral communities, Palmas, *Vegetation, Zonation.

Several vegetation zones are distinguished. No endemics were encountered.--Copyright 1972, Biological Abstracts, Inc.
W73-05181

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MULTIPLE-STATE FLASH EVAPORATOR,
Weir Westgarth Ltd., East Kilbride (Scotland).
R. S. Silver.
U. S. Patent No. 3,684,662, 2 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 3, p 1061, August 15, 1972.

Descriptors: *Patents, *Flash distillation, Brine, Fresh water, *Desalination, Separation techniques, Equipment, *Evaporation, *Condensation, Salt water, Sea water, Potable water.

Feed liquid first passes through a heater located in the condensing section located in the vapor space of a flash chamber in each of a plurality of stages of the evaporator. After being heated to the required temperature, the liquid is introduced into the first flash chamber to flow through each flash chamber counter to or transversely of the flow of liquid being heated and partly flashed into vapor. The vapor is condensed on the heater as a liquid distillate. (Sinha-OEIS)
W73-04947

DESALINATION OF SEA OR BRACKISH WATER BY MULTI-STAGE FLASH EVAPORATION,
Societa Italiana Resine S.p.A., Milan (Italy). (assignee).
D. Barba, C. D'Agostino, and G. Liuzzo.
U. S. Patent No. 3,684,661, 2 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 901, No 3, p 1061, August 15, 1972.

Descriptors: *Patents, *Desalination, Sea water, Brackish water, Saline water, Fresh water, *Evaporation, *Condensation, Separation techniques, Equipment, Treatment.

A flash desalination evaporator has a number of expansion chambers in series and discharge openings for flow of water between the chambers. Each chamber has a transverse dam shaped like half of a sine curve, sloping with its upper edge forward in the direction of flow, and standing from 5 cm to 10 cm higher than the upper side of the flow opening. The shape facilitates the release of water vapor from the saline solution and thus minimizes pressure drops. Two vertical longitudinal baffles run the full length of the casing and enclose an evaporation and two condensation zones. These baffles contain a discontinuity in which filters trap the droplets while allowing the water vapor to pass from the evaporation zone to the condensation zones. (Sinha-OEIS)
W73-04948

ECONOMICS OF ION-EXCHAGE TECHNIQUES FOR MUNICIPAL WATER--QUALITY IMPROVEMENT,
Bresler and Associates, Inc., New York.
For primary bibliographic entry see Field 05F.
W73-05053

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons, Brinckeroff, Quade and Douglas, Inc., Denver, Colo.
For primary bibliographic entry see Field 05F.
W73-05054

COMPUTERIZED PROCEDURE FOR ESTIMATING COSTS OF DESALTING SYSTEMS,
Banner (J. T.) and Associates, Inc., Brookings, S. Dak.
D. L. Kurtz, R. C. Huntsinger, and J. Hatch.
Journal of the American Water Works Association, Vol 64, No 11, p 741-745, November, 1972. 3 tab, 4 ref.

Descriptors: *Desalination processes, Economics, *Water quality, *South Dakota, *Groundwater resources, *Saline water, *Computer programs, Water supply, Fresh water, Wells, Municiple water, Operating costs, Surface water, Water shortage, Missouri River, Estimating, Systems analysis.
Identifiers: Great Plains region, Rural communities.

A computer program for analyzing and calculating water-system costs is presented. Described is its use in a study to determine the comparative costs and beneficial aspects of converting saline water to fresh-water supplies for selected municipalities in South Dakota. The majority of cities in this state are far enough away from the Missouri River, the only adequate full-time surface water supply source, so that water transmission costs are not economically feasible; they must, therefore, rely upon groundwater. But since most of the groundwater is saline in nature, there is a need for economical methods to reduce this salinity. The computer program as developed presents itself as an economical tool for evaluating the feasibility of several water-desalting methods for a given application. Discussed in detail are the study procedures and the computerized calculating procedures. The program provides good relative results for eliminating more costly processes and may be easily modified for future updating of cost-analysis procedures. (Bell-Cornell)
W73-05055

STUDIES ON THE SUPPLYING WATER CONVERTED FROM SEA WATER WITH MULTI--STAGE FLASH DISTILLATION PLANTS, (IN JAPANESE),
National Inst. of Hygienic Sciences, Tokyo (Japan).
Y. Sayato, S. Matsui, M. Tonomura, Y. Ban, and M. Yamaguchi.
J Hyg Chem. Vol 17, No 6, p 412-418, 1971, Illus, English summary.
Identifiers: Chlorides, *Distillation, Hardness, Japan, Nitrogen, Phosphates, Seawater, *Water supply, *Desalination.

To examine the effect of multi-stage flash distillation on the conversion of polluted sea water, quality tests on freshwater were carried out. The plant used was a coal mining company in Ikeshima, Nagasaki, (Japan) with a distilling capacity of 2650 ton/day. It was possible to prevent the NH3-N distillation completely when the pH value of sea water was adjusted to 4.0 with H2SO4. Efficiency of purification of sea water by this plant was excellent, but total hardness, chloride, phosphate and metaphosphate of supply water were higher than those of total distilled water, because of the addition of metal-masking reagents and brine to the supply water.--Copyright 1972, Biological Abstracts, Inc.
W73-05169

3B. Water Yield Improvement

INCREASING WATER SUPPLIES BY SUPPRESSION OF RESERVOIR EVAPORATION,
Oklahoma Water Resources Research Inst., Sillwater.
F. R. Crow.
Available from the National Technical Information Service as PB-214 511, $3.75 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, January 12, 1973. 37 p, 20 fig, 2 tab, 12 ref. OWRR A-014-OKLA (1), 14-31-0001-3036.

Descriptors: Evaporation, Reservoirs, Seepage, Hydrologic budget, *Energy budget, Water supply, *Evaporation control, *Reservoir evaporation, Water conservation, *Seepage control, Ponds, Linings, *Chemcontrol, Wateryield improvement.
Identifiers: *Butyl linings, *Styrofoam panels.

Water supplies in Southwestern reservoirs are seriously affected by evaporation. Chemical evaporation suppressants are only 35% to 40% efficient and are seriously affected by the wind. As an alternative, floating covers of solid or flexible materials offer a practical method of suppressing evaporation on small reservoirs. This study was made on paired experimental ponds to determine the extent to which evaporation losses are reduced by the use of floating solid panels. The ponds, 0.28 acres in area and 6 feet deep, were lined with nylon reinforced butyl rubber membranes for seepage control. Energy budget and water budget instruments were installed and operated. The principal tests were the floating rafts constructed of 1 inch thick styrofoam which were found to be highly efficient in suppressing evaporation. Unpainted styrofoam panels covering 48% of the area reduced evaporation 35%. Long duration tests on similar panels, painted white for increased reflectance, resulted in 43% to 49% evaporation reduction when 45% of the area was covered. The insulating properties of the styrofoam panels significantly reduced daily variation in stored thermal energy. Over long periods the styrofoam had no significant effect on the total thermal energy content of the pond.
W73-04558

REPRODUCTIVE BIOLOGY OF AELUROPUS LITORALIS (WILLD.) PARL.,
Tel-Aviv Univ. (Israel). Dept. of Botany.
For primary bibliographic entry see Field 03C.
W73-04596

SOIL-LOSS CONSIDERATIONS IN CHAPARRAL-TO-GRASS CONVERSIONS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-04602

ON PRECIPITATION SENSOR NETWORK DENSITIES FOR EVALUATING WINTERTIME OROGRAPHIC CLOUD SEEDING EXPERIMENTS,
Colorado State Univ., Fort Collins. Dept. of Statistics.
P. W. Mielke, Jr., C. F. Chappell, and L. O. Grant.

Water Resources Bulletin, Vol 8, No 6, p 1219-1224, December 1972. 1 fig, 4 tab, 8 ref. NSF Grant GIe31460 USBR Contract 14-06-D-6810.

Descriptors: *Weather modification, *Data collections, *Statistical methods, *Colorado, *Cloud seeding, Networks, Variability, Precipitation gages.
Identifiers: *Principal component analysis.

Principal component analysis was used to investigate requirements for gage-network density in studies of wintertime seeding of orographic clouds. Three mountain passes in the vicinity of Climax, Colorado were instrumented. The eighteen or more evenly spaced precipitation sensors of each pass are almost completely described by three principal components. These three principal components represent mean precipitation, slope orientation to storm systems, and elevation. These principal components were evaluated with a proportionality test and the runs test. The results suggest that the loss of experimental information caused by low-density networks may be of little consequence. (Knapp-USGS)
W73-04791

3C. Use of Water of Impaired Quality

SOIL AND WATER MANAGEMENT FOR SALINITY CONTROL,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-04552

WATER MINING TO MAKE THE DESERTS BLOOM,
For primary bibliographic entry see Field 04B.
W73-04584

REPRODUCTIVE BIOLOGY OF AELUROPUS LITORALIS (WILLD.) PARL.,
Tel-Aviv Univ. (Israel). Dept. of Botany.
G. Pollak, and Y. Waisel.
Annals of Arid Zone, Vol 10, No 2 and 3, p 165-175, June-September 1971, 5 fig, 4 tab, 15 ref.

Descriptors: *Germination, *Reproduction, *Halophytes, *Photoactivation, *Sodium chloride, Saline water, Grasses, Salt tolerance, Seeds, Seed treatment, Bioassay, Environmental effects, Light, Arid lands, Saline soils, Plant physiology.

Aeluropus litoralis is a halophytic grass species native to banks of salty springs and brackish water ponds, as well as to other saline habitats with high water tables. It is widely spread over the Mediterranean and Irano-Turanian phytogeographical regions. Despite the fact that large masses of caryopses ripen annually, very few seedlings, if any, are observed in native habitats in Israel. In order to clarify some ecological aspects of this species, germination and vegetative reproduction was studied under various environmental conditions. Germination of caryopses is light-dependent. Temperature effects both germination percentage and germination rates. Although Aeluropus litoralis is a halophyte, optimal germination occurs in non-saline media. Practically no germination was found in media containing NaCl in concentrations exceeding 0.3M. Vegetative reproduction is more tolerant to NaCl than reproduction from seeds and cuttings will root even in media containing 0.6M NaCl. (Black-Arizona)
W73-04596

NEW FINDINGS ON THE USE OF TRICKLE IRRIGATION SYSTEMS IN THE UNITED STATES, AUSTRALIA AND ISRAEL,
For primary bibliographic entry see Field 03F.
W73-04894

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND VII. GROUND WATER AND SOIL SALINITY IN THE KUROW-DUNTROON DISTRICT,
Department of Agriculture, Mosgiel (New Zealand). Invermay Agricultural Research Center.
G. G. Cossens, and D. S. Rickard.
New Zealand Journal of Agricultural Research, Vol 13, No 2, p 218-224, 1970. 2 tab, 4 ref.

Descriptors: *Ground water, Soils, *Irrigation, Chemical analysis, Salinity, Soil properties, Chemical properties, Irrigation effects.
Identifiers: *New Zealand.

The surface waters of the Kurow-Duntroon irrigation area are of low salinity. Except for a very restricted area the ground water is also of low salinity and is at too great a depth to cause soil salinity problems as a result of irrigation. Leaching of the few saline areas should be possible with controlled irrigation. (Skogerboe-Colorado)
W73-04908

INFLUENCE OF SOIL SALINITY ON PRODUCTION OF DRY MATTER AND UPTAKE AND DISTRIBUTION OF NUTRIENTS IN BARLEY AND CORN: I. BARLEY (HORDEUM VULGARE L.),
Agricultural Experiment Station, Baghdad (Iraq). Dept. of Soils.
N. A. K. Hassan, J. V. Drew, D. Knudson, and R. A. Olson.
Agronomy Journal, Vol 62, No 1, p 43-45, 1970. 1 fig, 2 tab, 10 ref.

Descriptors: Soils, Salinity, *Barley, Crop response, *Saline soils, *Salt tolerance, *Nutrients, Absorption, *Corn (Field).
Identifiers: Nutrient distribution, Dry matter production.

The production of dry matter and the uptake and concentration of nutrients by barley (hordeum vulgare L.) from soil adjusted to different levels of salinity with a mixture of salts were evaluated in a greenhouse study. Following germination of the plants, soil salinity levels ranging from EC values of 0 to 30 mmhos/cm of the soil solution at field capacity were induced by additions of a salt solution containing one part Na2SO4, one part MgSO4, and one part CaCl2. During the growth period of 98 days, increasing soil salinity increased sulfate-S and chloride in the saturation extract and lowered soil pH. Exchangeable Na, Mg, and Ca increased markedly while exchangeable K and available P increased only slightly. Acid-extractable Mn increased, but there was little or no effect on acid-extractable Zn, Fe, and Cu. Production of dry matter by the vegetative parts and grain heads of barley increased up to an EC of 12, then decreased at salinity levels above this value. Coefficients of correlation indicate significant negative relationships between soil salinity and uptake of P, K, Ca, Fe, and Cu by the vegetative parts and grain heads of barley. Conversely, significant positive correlations occur between soil salinity and uptake of Mn and Na by barley. (Skogerboe-Colorado)
W73-04916

EFFECTS OF TEMPERATURE AND FLOODING ON RICE GROWING IN SALINE AND ALKALINE SOIL,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
G. A. Place, M. A. Siddique, and B. R. Wells.
Agronomy Journal, Vol 63, No 1, p 62-65, 1971. 4 tab, 14 ref.

Descriptors: *Flooding, *Submergence, Alkalinity, *Temperature, *Rice, Chemical properties, Irrigation effects, Soils, Crop production.

'Bluebelle' cultivar of Oryza sativa L. was grown in a growth chamber at 4 and 16, 10 and 21, 16 and 27, and 21 and 33C night (10 hr) and day (14 hr) temperatures, respectively. Flood water was applied 12 (early) or 24 (late) days after seedling emergence at 6- and 12-cm depths to seedlings growing in saline, alkaline, and normal Crowley silt loam soil. When temperature was increased, the order of dry matter production by plants growing in the various soils was normal > saline > alkaline. Applying flood water 12 days after seedling emergence caused plants growing in saline and normal soils to produce more dry matter, whereas those growing in alkaline soil produced more dry matter when flooded 24 days after seedling emergence. Plants growing on saline and alkaline soils at 21 and 27C were chlorotic and P/Zn was less than 1.0. When temperature was increased to 31C chlorosis disappeared and P/Zn was greater than 1.0. Bicarbonate level of water above the alkaline soil was higher when flooding was delayed. This suggested young seedlings were more sensitive to HCO3- than were older seedlings, since growth was greater with delayed flooding. Flooding saline soil early produced lower EC and Cl- values in the water than did late flooding. Thus, plants grew more when flooded early because salinity was lower. (Skogerboe-Colorado)
W73-04931

GROWTH AND WATER POTENTIAL OF ROOT CROPS AS INFLUENCED BY SALINITY AND RELATIVE HUMIDITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman, and S. L. Rawlins.
Agronomy Journal, Vol 63, No 6, p 877-880, 1971. 4 fig, 4 tab, 12 ref.

Descriptors: *Salinity, *Humidity, Environment, Growth, Crop production.
Identifiers: *Root crops, Leaf water potential, Osmotic potential.

The interaction of relative humidity and salinity on garden beet, onion, and radish was studied in sunlit climate chambers at temperatures cycling daily between 26 and 10C. Average daytime relative humidity (RH) was controlled at 45 and 90%. The root medium of each crop was maintained at four different osmotic potentials, the range depending on the crop's salt tolerance. With a nonsaline root medium, increasing RH from 45 to 90% increased the yield of beet by 50% and radish by 15%, but did not enhance the yield of onion. In saline root media, high RH significantly raised the salinity level at which the yield was reduced to 50% of the nonsaline yield for onion and radish, but did not affect this level for beet. Linear relationships between leaf water and osmotic potentials and the osmotic potential of the root medium were found for all three crops. Leaf turgor potential was not affected by salinity in beet and onion but was reduced in radish. The relationship between crop yield and leaf water was linear. The difference in leaf water for plants between full yield and almost no yield was only 13 bars for beet, 6 bars for radish, and 4 bars for onion. (Skogerboe-Colorado)
W73-04932

EFFECT OF VARIOUS SALINITY REGIMES ON GROWTH, LEAF EXPANSION AND TRANSPIRATION RATE OF BEAN PLANTS,
Volcani Inst. of Agricultural Research, Israel, Bet-Dagen (Israel).
A. Meiri, and A. P. Mayber.
Soil Science, Vol 109, No 1, p 26-34, January 1970. 5 fig, 5 tab, 20 ref.

Descriptors: *Soil chemistry, *Salinity, *Plant growth, Beans, Inorganic compounds, Saline soils, Soil environment, Transpiration.

Bean plants were grown under various fluctuating regimes of salinity in an attempt to simulate the field conditions prevailing in salinity-affected areas. In all experiments growth was retarded, the

retardation being dependent on the rate of salinization, the ultimate level of salinity and the duration of exposure to the saline conditions. Transpiration was reduced by, and in proportion to, salinity. Transfer of plants from a saline to non-saline medium resulted in a transient burst of growth and in an increase of transpiration rate, but not to the level of the non-salinized control plants. The fluctuating nature of the salinity regime under normal field conditions can be expected to affect growth and transpiration in a manner similar to, but less severe than that found in experiments carried out under conditions of constant salinity levels. The degree of retardation of growth and transpiration of plants exposed to conditions of changing salinity will be modified by the rate of salinization and the direction of the fluctuations in the salinity level of the soil. (Skogerboe-Colorado State)
W73-04961

ELECTRIC CONTROLS FOR AUTOMATIC SURFACE IRRIGATION SYSTEMS WITH REUSE SYSTEM,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 03F.
W73-05007

3E. Conservation in Industry

THE IMPACT OF PUBLIC WATER UTILITY PRICING POLICY ON INDUSTRIAL DEMAND AND REUSE,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 06D.
W73-04553

NEGATIVE AIR PRESSURE CONVEYING,
Western Washington Research and Extension Center, Puyallup.
E. R. Wolford.
Food Technol, Vol 26, No 2, p 37-41, 1972, Illus.
Identifiers: *Air pressure conveyance, Bacterial contamination, Pressure, Transport, *Vegetables, *Water utilization, *Waste water disposal, Conveyance.

Negative air pressure conveying (NAPC) is a practical means of conveying blanched vegetables from the preparation area to the freezing tunnel in a vegetable freezing plant. With proper sanitation, NAPC reduces the build-up of bacteria in the line by eliminating transfer points between processing machinery in the line. NAPC also has the potential of drastically reducing water usage and subsequent water disposal problems.--Copyright 1972, Biological Abstracts, Inc.
W73-04612

3F. Conservation in Agriculture

DIFFERENT EFFECTS OF CHLORMEQUAT ON CHLOROPHYLL, PROTEIN AND YIELD IN COTTON GROWN UNDER VARYING WATER REGIMES,
National Research Centre, Cairo (Egypt). Botany Lab.
M. M. El-Fouly, H. A. El-Hamawi, and A. F. A. Fawzi.
Plant and Soil, Vol 35, p 183-186, 1971. 1 tab, 14 ref.

Descriptors: *Plant growth regulators, *Moisture stress, *Retardance, *Biochemistry, *Drought resistance, *Agricultural chemicals, Bioassay, Chlorophyll, Proteins, Cotton, Crop production, Application methods, Limiting factors, Resistance, Metabolism, Plant physiology, Plant pigments, Chemcontrol, Inhibitors, Crop response.
Identifiers: Chlormequat.

Chlormequat (CCC) has shown growth-retarding effects upon several plants thus inducing shorter, thicker and darker green plants with increased chlorophyll content. Plants treated with CCC exhibit higher resistance to stress conditions including soil drought. It was presumed that plants treated with CCC could resist water stress conditions due to the increased root/top ratio or due to higher protein and photosynthetic pigments content found in treated plants. This study investigates the effect of CCC on drought resistance in relation to the changes in chlorophyll, protein and total-N contents. Cotton plants (Gossypium barbadense) grown under water stress conditions showed significant decreases in yield, though only slight decreases in protein N as well as in chlorophyll content were detected. Chlormequat application minimized the decreases in yield and caused significant increases in both protein N and chlorophyll contents. It is concluded that changes induced by CCC in cotton yield are independent from those occurred in chlorophyll and protein N contents. (Black-Arizona)
W73-04581

RESPONSE OF UNIRRIGATED WHEAT TO NITROGEN AND ITS METHOD OF APPLICATION,
Rajasthan Univ., Jaipur (India). Dept. of Agriculture.
G. S. Shekhawat, R. L. Kothari, and M. L. K. Mehta.
Annals of Arid Zone, Vol 10, No 1, p 48-51, March 1971. 2 tab, 6 ref.

Descriptors: *Wheat, *Fertilizers, *Application methods, *Soil amendments, *Foliar application, Grains (Crops), Crop production, Agronomy, Agriculture, Bioassay, Dry farming, Arid lands, Nutrients.
Identifiers: India, Rajasthan.

Wheat is an important cereal crop, grown under heavy black soils of southeastern Rajasthan (India), occupying nearly twelve thousand hectares. The crop is predominantly rainfed and is grown entirely on the limited quantity of conserved soil moisture during the rainy season. Fertilizers are not generally applied to this crop under such conditions. Recent studies, however, showed that higher yields are possible under unirrigated conditions by nitrogen fertilization. A part of this nitrogen, applied as foliar spray, also contributed toward higher yields. Therefore, a study was conducted to determine optimum dosage and suitable method of application under an unirrigated condition for two varieties of wheat. Results of field experiments indicate that average yield of grain and straw increased by 14.5 and 12.5 percent respectively with the application of 20 kg N/ha over control. Basal application in soil gave higher yields than one-half basal/one-half foliar application. Variety RS 31-1 proved superior to local wheat. (Black-Arizona)
W73-04583

WATER MINING TO MAKE THE DESERTS BLOOM,
For primary bibliographic entry see Field 04B.
W73-04584

WATER UPTAKE AND RADICLE EMERGENCE OF COTTONSEED AS AFFECTED BY SOIL MOISTURE AND TEMPERATURE,
D. F. Wanjura, and D. R. Buxton.
Agronomy Journal, Vol 64, No 4, p 427-431, July-August 1972. 5 fig, 1 tab, 7 ref.

Descriptors: *Germination, *Absorption, *Cotton, *Soil moisture, *Soil temperature, Seeds, Moisture stress, Mathematical models, Distribution patterns, Model studies, Soils, Plant growth regulators, Soil-water-plant relationships, Regression analysis, Equations.
Identifiers: *Water uptake, *Accumulation curves, *Seed moisture.

Inhibitional water uptake is a nonlinear mathematical process which produces an S-shaped accumulation curve under constant flow conditions. This investigation measures water uptake and time required for 3-mm radicle emergence (germination) of cottonseed as influenced by a broad range of soil temperatures and moistures in order to develop a model simulating cotton germination. Cottonseed (Gossypium hirsutum L.) was placed in covered plastic cups of soil, and seed moisture changes were measured until germination under constant temperatures. Emergence time decreased according to a Q10 relationship between 15.6 and 32.2 C with little change at 37.8C. Water uptake rate increased with higher temperatures and lower soil moisture tensions of 0.3 to 10 bars. Seed moisture content tended to be higher at extreme temperatures (up to 37.8 C) than at intermediate ones. Seeds absorbed water in excess of minimum requirement for radicle emergence under some constant temperature and moisture environments. Three multiple linear regression equations are developed to estimate response of germinating seeds under constant soil moisture tension and temperature. Considerable variability in emergence time is noted. The effect of temperature on seed moisture level diminishes at high soil moisture tension, as does the effect of soil moisture at low temperatures. (Popkin-Arizona)
W73-04585

GROWING TOMATOES IN WEST TEXAS,
J. Lackey.
Ranch Magazine, Vol 52, No 9, p 16, 31, June 1972, 4 fig.

Descriptors: *Tomatoes, *Vegetable crops, *Hydroponics, *Nutrient requirement, *Crop production, Porous media, Carbon dioxide, Oxygen, Photosynthesis, Salts, Plant growth regulators, *Texas.

The commercial operation of tomato cultivation based on hydroponics is reported from west Texas. Plants are supplied with water which contains minerals and other plant foods, so that no soil is used. Vegetables are supported by porous material which acts as a wick in relaying nutrients from the water to the plant roots. Green plants manufacture their own organic food from carbon dioxide and oxygen by photosynthesis. Nutrients are supplied as mineral salts. Plants require carbon, hydrogen, oxygen, nitrogen, phosphorous, potassium, magnesium, sulfur, calcium, iron, manganese, boron, zinc, copper and molybdenum. The commercial operation near San Angelo produces tomato plants which stand six feet high. (Popkin-Arizona)
W73-04586

CATTLE FEED FROM MESQUITE WOOD,
B. Bracher.
Cattleman, Vol 58, No 8, p 43-45, January 1972. 5 fig.

Descriptors: *Mesquite, *Proteins, *Cattle, *Feeds, *Phreatophytes, Water conservation, Ranges, Costs, Grain sorghum, Microorganisms, Hydrolosis, Digestion, Food processing industry, Texas.

Mesquite, a high protein, inexpensive cattle feed and desert tree, is the subject of research at Texas Tech University. The shrub is a major water user in range lands of Texas. Feed can be produced from mesquite at a cost of $27 to $35 per ton, which is less than the cost of milo and cottonseed ($55 per ton). Pulverized mesquite is put into a mineral salts solution with a nitrogen source. The solution is innoculated with microorganisms, which convert mesquite to a protein substance. A 50-percent hydrolysis of mesquite is yielding a 20-percent protein substance. The feed is highly

digestable and comparable to soybean and other protein sources. Production of mesquite feed (98A) may be an incentive to clearing mesquite-infested land and meeting future protein needs. About 1000 pounds of mesquite yield 700 pounds of feed with 8.2 percent crude protein, 59 percent carbohydrates, and 1 to 6 percent fats. Production is expected to feed 50,000 cattle per day in the future. (Popkin-Arizona)
W73-04587

AUTOMATED SYSTEMS IN NURSERY IRRIGATION,
California Univ., Riverside. Agricultural Extension Service.
T. Furuta.
American Nurseryman, Vol 85, No 10, p 44-45, 48-50, May 1972.

Descriptors: *Irrigation systems, *Fertilizers, *Automatic control, *Manual control, *Irrigation efficiency, Plant growth, Tubes, Water conservation, Installation costs, Crop production.
Identifiers: *Nursery plants.

The use of water and fertilizer in a nursery environment is investigated. Small plants in containers are generally irrigated automatically. Large plants in containers are irrigated manually or by tube systems. Arrangements of cans will affect irrigation efficiency, as water falling between containers is wasted. Smaller amounts of fertilizer are recommended to develop better control systems. Water conservation practices will be encouraged by using a direct outlet and nozzle to each plant. Outlets may consist of perforated cans which provide overflow. Tube irrigation is difficult because of slippage, plugging, non-uniform wetting, breakage by rabbits and clumsiness of the system. High costs of installation of automatic systems are justified in that they save water, labor and fertilizer costs. More efficient use of water and fertilizer is argued for all nurserymen. (Popkin-Arizona)
W73-04588

TRICKLE IRRIGATION SURGES AHEAD,
Michigan State Univ., East Lansing. Dept. of Horticulture.
A. L. Kenworthy.
American Fruit Grower, Vol 92, No 4, p 15-17, 34. April 1972. 5 fig, 1 ref.

Descriptors: *Irrigation systems, *Irrigation efficiency, *Crop production, *Water conservation, *Soil moisture, Moisture stress, Root systems, Field capacity, Pressure, Orchards, Trees, Nitrogen, Installation costs, California, Michigan.
Identifiers: *Trickle irrigation, Israel.

Trickle, drip or daily flow irrigation prevents moisture stress by maintaining favorable soil moisture conditions on at least a portion of the root system. Water is applied at low pressure (15 psi) at slow rates (1 to 2 gph) to maintain a part of the soil at or near field capacity, and soil moisture measurements then can be used to indicate whether adequate water has been applied. Orchards may be irrigated this way, and each 10 gpm well may irrigate 6 acres. Technical details are presented concerning the installation of trickle irrigation systems. Experiences in San Diego County, Israel, and East Lansing, Michigan, are outlined. Trees respond to trickle irrigation as if they received extra nitrogen. An installation cost of $50 to $100 per acre is practical. (Popkin-Arizona)
W73-04589

CONCENTRATION OF PICLORAM IN RUNOFF WATER,
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 05B.
W73-04591

EFFECTS OF TIME OF DAY, MOISTURE STRESS, AND FROSTING ON THE ALKALOID CONTENT OF PHALARIS TUBEROSA,
Commonwealth Scientific and Industrial Research Oranization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02I.
W73-04592

DESERT GRAPEFRUIT PRUNING, ORCHARD THINNING TRIAL,
California Univ., Riverside. Agricultural Extension Service.
D. D. Halsey, C. D. McCarty, and S. B. Boswell.
Citrograph, Vol 57, No 3, p 99, 101, 112, January 1972, 3 fig, 2 tab.

Descriptors: *Grapefruit, *Crop production, *Citrus fruit, *Economic prediction, *Orchards, Lemons, Oranges, Soil types, Irrigation, Income, Fruit crops, Root development.
Identifiers: *Pruning, *Thinning, Appearance, Accessibility, Fruit quality.

Orchard thinning trials on red grapefruit over a four-year period were conducted to determine if increase per acre yield or grower returns could be achieved. Trees consisted of rough lemon and cleopatra mandarin planted near Coachella, California. Six replications were used to remove variation due to soil and irrigation. While pruning and thinning caused substantial improvement in appearance and accessibility, these operations failed to show an increase in either mean per acre yield, quality, or income over the test period. The evidence appears to confirm that the number of trees per acre is not an important factor in per-acre yield, nor is pruning likely to increase yield in crowed groves. Rootstock effects on yield and quality may be important in the early years of an orchard. Tabular and graphical data show economic returns and crop yields. (Popkin-Arizona)
W73-04593

EFFECT OF PLANTING DATE ON WATER--USE AND ITS EFFICIENCY IN DRY LAND GRAIN SORGHUM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Field Crops.
A. Blum.
Agronomy Journal, Vol 64, No 6, p 775-778, Nov-Dec 1972, 4 fig, 3 tab, 20 ref.

Descriptors: *Dates, *Water utilization, *Water demand, *Crop production, *Grain sorghum, Planting management, Consumptive use, Efficiencies, Dry farming, Precipitation (Atmospheric), Seasonal, Soil moisture, Water rates, Plant growth, Plant growth regulators, Spring, Water supply, Limiting factors, Vegetation, Leaves, Weight, Emerging vegetative state, Moisture stress, Adaptatiou, Root development, Evapotranspiration.
Identifiers: *Hybrids, Israel, Soil extraction profiles, Tillering, Leaf diffusion resistance, Heading, Leaf desiccation.

No precipitation occurs in the growing season, and water is provided under dry land conditions by stored soil moisture in many of the grain sorghum (Sorghum bicolor (L.) Moench) growing areas. This research was conducted to appraise the postulation that water regime is the major operative factor responsible for different yield response of dry land grain sorghum. Four grain sorghum hybrids were planted on two spring dates for four consecutive years in Israel under conditions of limited water supply, or preplanting stored soil moisture. Vegetative development, grain yield and soil water extraction profiles were determined to show early planting increased grain yield through increased tillering and greater weight per grain. Early planted sorghum used about half as much water as the late plant, from emergence to 31 days. Early plants were less water stressed as evidenced by lower leaf diffusion resistance prior to heading and smaller reduction in leaf desiccation after heading. Lower water use by early plants was ascribed to lower potential evapotranspiration, smaller leaf desiccation and slower root development. Total amount of water consumed by both time plantings were the same. No differences were noted in terms of hybrid adaption to early planting or water use. Stored soil moisture is necessary for dry land sorghum production. (Popkin-Arizona)
W73-04594

THE EFFECT OF SOIL MOISTURE REGIMES ON WATER USE EFFICIENCY AND GROWTH COMPONENTS OF ALFALFA,
Arizona Univ., Tucson. Coll. of Agriculture.
R. J. Joy, H. T. Poole, and A. K. Dorbenz.
Progressive Agriculture in Arizona, Vol 24, No 5, p 9-11, 16, Sept-Oct 1972, 1 fig, 3 tab, 9 ref.

Descriptors: *Alfalfa, *Irrigation efficiency, *Soil moisture, *Water utilization, *Consumptive use, Plant growth, Crop production, Leaves, Proteins, Variability, Fertilizers, Phosphates, Seeds, Field capacity, Experimental farms, Water demand.
Identifiers: *Cultivars.

An alfalfa irrigation study was conducted at Tucson, Arizona (1968-1970) to investigate water-use efficiency, yield, leaf-to-stem ratio, percentage protein, and stand decline of four alfalfa cultivars grown under three moisture regimes. The research notes the great variation in amount of water used to grow alfalfa. Mesa-Sirsa, Moapa, Sonora and El-Unico seeds were planted at the rate of 20 lbs/acre, where plots were treated with phosphate before seeding, and irrigated after seeding as often as necessary to obtain optimum stand. Irrigation regimes in 1968 and 1969 consisted of maintaining field capacity when 30, 60 and 90 percent of available soil moisture was removed in the surface to 3 ft. In 1970, the lower (90 percent) moisture was utilized to a depth of 4 ft. Alfalfa may use 65 to 90% of available soil moisture and not significantly reduce production, though maximum efficiency of production is realized when the best adapted cultivars are used and irrigation schedules are based on monitoring available moisture. Alfalfa grown under the low regime (90 percent) had more plants per unit area than that grown under high or medium regime. El-Unico produced more forage than other cultivars, and was more efficient as it produced more forage on the same amount of applied water. El-Unico had a lower leaf-to-stem ratio than other cultivars, with insignificant protein differences. Leaf area index, not a good predictor of seasonal production, showed a positive relationship to forage yield at individual cuttings. (Popkin-Arizona)
W73-04595

ECONOMIC ANALYSIS OF IRRIGATION SYSTEMS APPLICABLE TO THE NORTHERN PLAINS,
South Dakota State Univ., Brookings. Water Resources Inst.
G. D. Rose, and W. Aanderud.
Available from National Technical Information Service as PB-214 487, $3.00 in paper copy, $0.95 in microfiche. Completion Report January 1973. 122 p, 72 tab, 5 ref. OWRR B-009-SDAK (2). 14-01-0001-1946.

Descriptors: Irrigation, Linear programming, *Irrigation systems, Optimization, Economics, Labor supply, Capital, *Great Plains, *Sprinkler irrigation, Irrigation effects.

Linear programming was used to examine the effects of irrigation on a simulated representative farm firm in the Eastern Missouri Slope Area of South Dakota. Comparisons were made between dryland farming and irrigation with three types of sprinkler irrigation systems under varying degrees of labor and capital restrictions. The three types of

systems were selected to provide a range of capital and labor intensity. Labor and capital restrictions were developed to reflect conditions in the selected geographical area. Results indicated that irrigation would be profitable in the area. In all cases, however, the system yielding the greatest net returns was the system with the highest labor requirements. This appeared to be due to the fact that the more capital intensive systems were not technically capable of irrigating as much land area. In all situations, the firm tended towards using irrigation to increase forage and feed grains production for use in dry-lot cattle feeding operations. Only in the most restricted labor and capital situations did the firm grow cash crops. Labor restrictions imposed restricted expansion of the firm before the capital restrictions. Shortage of labor in particular time periods was the most restricting factor. (Wiersma-So.Dakota)
W73-04634

SOIL SURFACE WATER DEPLETION AND LEAF TEMPERATURE,
Texas A and M Univ., College Station. Remote Sensing Center.
A. R. Aston, and C. H. M. Van Bavel.
Agron J. Vol 64, No 3, p 368-373. 1972. Illus.
Identifiers: *Crop production, *Remote sensing, Water depletion, Heat, Leaves, Loads, Soils, Surface, Analytical techniques, Temperature, Vigna sinensis D.

This work explores the feasibility of the remote detection of water depletion in a cropped field. It proposes that this may be accomplished by detecting the increase in the visible and thermal radiant heat loads upon plant leaves when the underlying soil surface dries. A theoretical model was constructed, relating leaf temperature to soil surface temperature. Parallel experiments were done using a gray podzolic soil. In spite of an increase of 15% in reflectivity upon drying, there was an increase in soil surface temperature from 20 to 50 C. The increased shortwave and longwave radiant loads on leaf arrays in the experiments resulted in leaf temperature increases of 2.5, .5, and 2 C in dry blotting paper, wet blotting paper, and leaves of the southern pea (Vigna sinensis), respectively. The leaf energy balance-soil water depletion model predicted these increases as well as the absolute temperatures, with an accuracy of 1 and 5% for the artificial and real leaves, respectively. The findings affirm that a technology can be developed for the remote detection of soil water depletion in field crops, but that the temperature differences involved are both small and variable.--Copyright 1972, Biological Abstracts, Inc.
W73-04685

RELATION OF MOISTURE CONTENT TO FAILURE STRENGTHS OF SEVEN AGRICULTURAL SOILS,
California Univ., Davis.
For primary bibliographic entry see Field 02G.
W73-04893

NEW FINDINGS ON THE USE OF TRICKLE IRRIGATION SYSTEMS IN THE UNITED STATES, AUSTRALIA AND ISRAEL,
E. D. DeRemer.
World Irrigation, Vol 20, No 6, p 14-16, December 1970, 4 fig, 1 tab.

Descriptors: *Irrigation systems, *Application methods, *Water conservation, Sprinkler irrigation, Irrigation engineering, Groundwater, Crop production, Lemons, Tomatoes, Melons, Sweet corn, Irrigation efficiency.
Identifiers: *Trickle irrigation, *Irrigation research, Peppers, Cucumbers.

Trickle irrigation has been receiving much publicity and attention throughout the world. Several workers, independent of each other, are reporting phenomenol water savings and sizable yield increases. Studies in Israel show increases of 50 to 100 percent with trickle irrigation as compared to sprinkler or furrow irrigation for tomatoes, cucumbers, melons, peppers, and sweet corn. Trickle irrigation was used on a 10-acre plot of lemons near Yuma, Arizona, with the following results. Water use was 1/19th, irrigation labor cost was 1/16th. Cultivation was reduced by 60 percent; fertilizer use was 20 percent, and yield was more than double. Another benefit of trickle irrigation is that poorer quality water can be used with no apparent damage to the area. (Skogerboe-Colorado State)
W73-04894

FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
F. G. Viets, Jr.
Journal of Soil and Water Conservation, Vol 26, No 2, p 51-53, March-April, 1971. 1 tab, 18 ref.

Descriptors: *Water pollution sources, *Agricultural chemicals, *Rates of application, Fertilization, Drainage effects, Environmental effects, Soil chemical properties, Leaching.

Fertilizers substantially reduce land needs for crop production. To arbitrarily restrict fertilizer use therefore, would be a national disaster. Instead of exposing more land to erosion and the accompanying loss of nutrients, fertilizer rates should be increased on better land and poorer land should be retired to permanent grass or tree cover. What the fertilizer rates should be, depends on the crop, site conditions, and magnitude of nitrate leaching. These judgements can only be based on experience and research not on arbitrary rules and regulations. (Skogerboe-Colorado State)
W73-04895

PESTICIDES,
Illinois Univ., Urbana. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-04897

FARM NITRATES..NO MENACE TO THE RIO GRANDE.
For primary bibliographic entry see Field 05B.
W73-04898

CALIFORNIA DRIP-IRRIGATION TESTS MAY PROVE METHOD SIGNIFICANT.

Irrigation Journal, Vol 21, No 2, p 12-13, March-April, 1971.

Descriptors: *Irrigation systems, *Application methods, Water conservation, Sprinkler irrigation, Irrigation engineering, Water pollution, Groundwater, Crop production, *California.
Identifiers: *Drip-irrigation, *Irrigation research, Avocados.

The drip-irrigation method of watering plants is now being tested on a 5-acre plot near Bonsall, California. The experiment is designed to evaluate the differences between drip-irrigation and the standard sprinkler type. The crop consists of avocado trees. Watering is for 4 hours daily with a flow rate of 12-15 gallons weekly. There are 3 drippers to a tree, one at the trunk and 2 at 2 feet from the trunk. The main objectives are to save water, reduce labor and 'Americanize' the system-get the right equipment made in this country. (Skogerboe-Colorado State)
W73-04899

PRACTICALITY ESTABLISHED FOR TRAVELING SPRINKLER SYSTEMS,
D. R. Sisson.
World Irrigation, Vol 20, No 2, p 15-16, March, 1970. 1 fig, 2 tab.

Descriptors: *Sprinkler irrigation, *Irrigation practices, *Automation, Distribution systems, Crop production.
Identifiers: *Automatic irrigation, Traveling sprinkler systems.

The types of traveling sprinkler systems are listed and their advantages discussed. Test data are quoted and the practicality developed. An equation for application and uniformity is presented and discussed. (Skogerboe-Colorado State)
W73-04900

FROST AND COLD PROTECTION BY SPRINKLERS: A NEW ASSESSMENT,
Rain Bird Sprinkler Mfg. Corp., Glenora, Calif.
A. S. Gray.
World Irrigation, Vol 20, No 2, p 12-13, March, 1970. 1 fig.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Frost protection, Temperature control, Ice, Frost action, Orchards, Irrigation engineering, Sprinkling.
Identifiers: Frost types, Frost damage.

Protecting crops with sprinkler irrigation is becoming more popular with growers who are learning the value of this type of protection. But if real results are to be obtained, a properly designed system, operated according to plan, will be the deciding factor. Design and operation guidelines are presented for the two types of frost common to cropping areas. Myths that sprinkler irrigation is an infallible crop protector are challenged. (Skogerboe-Colorado)
W73-04901

AUTOMATION OF SURFACE IRRIGATION WITH FLUIDIC DIVERTERS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
E. G. Kruse, P. A. Freeman, and H. R. Haise.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 3, p 357-361, March, 1970. 11 fig, 6 ref.

Descriptors: *Irrigation practices, *Surface irrigation, *Automation, Irrigation structures, *Diversion structures, Diversion.
Identifiers: *Flow dividers, Fluidic dividers.

Fluidic diverters can be designed to divert a stream of water from one to the other of two outlets, using no moving parts and no external source of energy. Diverters can be sized to carry discharges from a fraction of a gallon per minute up to several cubic feet per second. Irrigation diverters with approximate capacities of 2 and 5 cfs were operated in laboratory flumes. Operating heads, head losses, and discharges through the range of effective diverter performance were recorded. Control systems suitable for use in automating surface irrigation systems were developed. The diverters were further tested in the field with very satisfactory results. (Skogerboe-Colorado State)
W73-04903

MOISTURE SENSOR PLACEMENT FOR REGULATION OF FURROW-IRRIGATION SYSTEMS,
Valmont Industries, Valley, Nebr.
R. G. Myers, and D. M. Edwards.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 3, p 303-306, March, 1970. 5 fig, 16 ref.

Descriptors: *Irrigation practices, *Automatic control, *Irrigation systems, Surface irrigation, Furrow irrigation, Rates, Instrumentation.

Identifiers: *Soil moisture sensors, Intake rate, Water holding capacity.

A procedure has been developed for placing moisture-sensing devices in the soil profile to deactivate an automated furrow-irrigation system. Results of the study indicate that lateral sensor placement should be limited to the furrow centerline. A limitation of this nature makes it possible to determine sensor placement by having only to compute vertical sensor depth. Characteristics of surface flow along with the basic intake rate equation and the water holding capacity of the soil, provide a theoretical means for predicting vertical sensor depth. (Skogerboe-Colorado State)
W73-04904

NEED FOR ENVELOPE MATERIAL ABOVE DRAINTILE,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 04A.
W73-04906

IRRIGATORS SHAPE THEIR LAND FOR WATER CONTROL,
Soil Conservation Service, Harlingen, Tex.
B. J. Garner.
Soil Conservation, Vol 36, No 7, p 149-150, 1971.

Descriptors: *Land forming, Irrigation, Water control, *Irrigation efficiency, Irrigation practices, Land, *Water conservation, Land management, Texas.
Identifiers: Land leveling, *Rio Grande Valley (Tex).

Landowners shape their land for irrigation in the Lower Rio Grande Valley of Texas for better control of water. This means lower cost of labor for irrigating. It also means holding losses of water to a minimum. Leveling of fields makes possible the even distribution of irrigation water and rainfall, resulting in uniform crop growth. Land leveling must be designed in accordance with variations in soils, the crops to be grown, the water supply, and the method of irrigation in each case. The irrigators in this area have found that land leveling, plus good water mangement, has paid big dividends in conservation of irrigation water, retention of needed rainfall, lower costs, and more uniform and better crops. (Skogerboe-Colorado)
W73-04907

MEASUREMENTS OF NON-POTENTIAL EVAPORATION FROM WHEAT,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 02D.
W73-04909

YIELD OF GRAIN LEGUMES AS AFFECTED BY IRRIGATION AND FERTILIZER REGIMES,
G. M. Horner, and M. Mojtehedi.
Agronomy Journal, Vol 62, No 4, p 449-450, 1970. 4 ref.

Descriptors: *Fertilizers, *Crop production, *Moisture stress, Irrigation, Soil moisture, Legumes, Nitrogen, Phosphorus, Irrigation effects.

Chickpeas, cowpeas, and dry beans were grown under diffenent soil moisutre levels with split plot treatments of no fertilizer, N, P, and NP. Irrigations were given when 1/3, 2/3, and approximately all of the available water in the root zone was depleted. These moisture stresses were applied during different stages of plant growth. High moisture stress reduced grain yields 18 to 26% below the maximum values. This yield depression was most pronounced when the moisture stress occurred during bloom and early maturity. Yields for the medium and high moisture levels were statistically equal. Response to phosphorus fertilization varied with the field sites. Where phosphorus resulted in sizeable yield increases, high soil moisture increased the response to phosphorus and vice versa. The effect of nitrogen fertilization was not significant. (Skogerboe-Colorado)
W73-04910

FURROW IRRIGATION WITH DECREASING INFLOW RATE,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India). Coll. of Agricultural Engineering and Technology.
R. Lal, and A. C. Pandya.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No IR4, Proc. Paper 7748, p 451-460, 1970. 3 fig, 1 tab, 3 append, 11 ref.

Descriptors: *Furrows, *Inflow, Agricultural engineering, Design, Irrigation, Irrigation efficiency, Furrow irrigation, *Water conservation, Time, Rates, *Infiltration.
Identifiers: Time dependence.

A mathematical model has been developed to provide the manner in which the inflow stream size at the upstream end of a furrow must be reduced stepwise according to the infiltration characteristics of the soil so as to eliminate runoff losses from the downstream end and keep the deep percolation losses to the minimum. Owing to the high infiltration rate in the beginning the initial stream size may be large and kept constant till water reaches the end of furrow length. The total period of irrigation is divided into equal intervals of advance time. Equation for calculating the factors by which the initial stream size should be multiplied to get inflow rates during subsequent time intervals has been developed. Graphs have been presented for simplifying the calculations. The practical application of the analysis is illustrated by an example. (Skogerboe-Colorado)
W73-04911

AUTOMATIC CUTBACK FURROW IRRIGATION SYSTEM DESIGN,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
I. Nicolaescu, and E. G. Kruse.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR3, Proc. Paper 8358, p 343-353, 1971. 6 fig, 2 tab, 7 ref, 2 append.

Descriptors: *Furrow irrigation, *Furrow systems, *Surface irrigation, Irrigation, Runoff, Streams, Automation, Rates of application, Irrigation design.

A field method for determining the size of a constantly decreasing furrow irrigation stream just adequate to prevent runoff after an initial stream has advanced the length of the furrow is described. This reduced stream can be approximated by several streams of constant flow, each applied for equal times. Use of the constant streams makes the irrigation system amenable to automatic methods of water application. Assuming that stream size is to be varied by regulating head-on spiles set in the walls of the irrigation lateral, procedures for determining spile size, variation in elevation of adjacent banks of spiles, and heads on the spiles for each discharge are presented. Equations are given for the number of furrows to be irrigated from each bay of the lateral with a given water supply. Methods for determining times of application and volumes of water supplied by the initial stream and each of the reduced streams are given. An example illustrates the application of all procedures and equations. (Skogerboe-Colorado)
W73-04912

MODEL FOR FARM IRRIGATION IN HUMID AREAS,
Illinois Univ., Urbana.
J. S. Windsor, and V. T. Chow.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR3, Proc. Paper 8355, p 369-385, 1971. 4 fig, 2 tab, 14 ref, 2 append.

Descriptors: *Mathematical models, *Irrigation systems, Systems engineering, Agricultural engineering, Dynamic programming, Irrigation, Linear programming, Optimization, Operations research, Model studies.

A multicrop, multisoil, farm irrigation system is broken down into a number of discrete units, and then analyzed by means of a two-level optimization approach. At the first level of optimization dynamic programming is used to determine, on a per acre basis, the optimal irrigation policy, the maximum expected profit, and the expected monthly irrigation and labor and water requirements for each crop-soil combination and each level of irrigation development. At the next level of optimization linear programming is used to determine the irrigation system, the level of irrigation development, and the crop mix, which maximize the expected farm profit without violating any of the farm resource limitations. The model assumes that water supply is the important variable which controls plant growth, and uses a production function which is based on the concept of stress days. To show how the procedure may be set up on a computer, a hypothetical two-crop, two-soil, farm irrigation system is analyzed considering several resource combinations. (Skogerboe-Colorado)
W73-04913

SUBSURFACE IRRIGATION SYSTEM ANALYSIS AND DESIGN,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
Yu-Si Fok, and L. S. Willardson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR3, p 449-454, 1971. 1 fig, 5 ref, 2 append.

Descriptors: *Subsurface irrigation, *Irrigation systems, *Soil water movement, Irrigation design, Infiltration, Water flow, Permeability.
Identifiers: Two-dimensional flow.

By considering the phenomenon of subsurface irrigation as a case of two-dimensional infiltration, a method is developed for analyzing the water distribution pattern in the soil profile from a subirrigation pipe placed on a barrier. Equations of soil-water movement were used to establish the design criteria of the discharge, the burial depth and the spacing of the subsurface irrigation system. A numerical example is given to show the procedures of the proposed method for subsurface irrigation system analysis and design. (Skogerboe-Colorado)
W73-04914

WATER STORAGE AND DRAINAGE UNDER A ROW CROP ON A SANDY SOIL,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 04A.
W73-04915

PREDICTING IRRIGATION REQUIREMENTS OF CROPS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
W. P. David, and E. A. Hiler.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No IR3, Proc. Paper 7507, p 241-255, 1970. 10 fig, 3 tab, 2 append, 20 ref.

Descriptors: *Model studies, *Soil moisture, *Rainfall, Cotton, Grain sorghum, Irrigation, Irrigation practices, Water requirements, Forecasting, Probability.

A continuous soil moisture accounting model based on soil moisture depletion equations was developed. The model was adapted to an 18.6-acre experimental watershed and was used to estimate the monthly and seasonal irrigation requirements of cotton and grain sorghum. The distributions of the irrigation requirements of both crops as based on a 30-yr sample were found to be normal. Weekly rainfall probabilities for the watershed were calculated from a 30-yr sample using the incomplete gamma density function. The use of weekly rainfall probabilities in irrigation planning is shown. (Skogerboe-Colorado)
W73-04918

DIFFERENTIAL RESPONSE OF RICE VARIETIES TO TIMING OF MID-SEASON NITROGEN APPLICATIONS,
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.
B. R. Wells, and T. H. Johnston.
Agronomy Journal, Vol 62, No 5, p 608-611, 1970. 8 tab, 5 ref.

Descriptors: *Nitrogen, *Rates of application, *Crop response, Rice, Crop production.
Identifiers: Plant types, Lodging, Grain weight.

Field studies were conducted with rice (Oryza sativa L.) on Crowley silt loam soil using the important commercial cultivars 'Bluebelle,' 'Nova 66,' and 'Starbonnet.' Studied were the effects of rate and timing of mid-season N applications on grain yield, plant height, lodging, head-rice yield, and grain weight (g/M) of varieties (cultivars) differing in maturity and plant type. Maximum grain yields were associated with N applied at median internode lengths averaging 21.0, 58.5, and 5.0 mm for Bluebelle, Nova 66, and Starbonnet, respectively. Delaying mid-season N applications until these respective stages of plant development resulted in shorter plants and less lodging, accompanied by increased grain weight and head-rice yields. Variations in the median internode length at N fertilization, timed for a combination of maximum grain yield and minimum plant height and lodging, were closely associated with plant type. Starbonnet and Bluebelle, which have short, stiff straw and erect leaves, responded better to N applied at a shorter internode length than Nova 66, a taller, broader-leaved variety. When N was applied too early, Nova 66 produced considerably more excessive vegetation than did Bluebelle and Starbonnet. Both Starbonnet and Bluebelle have plant types which approach the one currently favored by many plant breeders. (Skogerboe-Colorado)
W73-04919

CONSUMPTIVE USE OF WATER BY ALFALFA IN WESTERN NEBRASKA,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
L. A. Daigger, L. S. Axthelm, and C. L. Ashburn.
Agronomy Journal, Vol 62, No 4, p 507-508, 1970. 4 tab, 7 ref.

Descriptors: *Alfalfa, *Consumptive use, *Moisture uptake, *Soil moisture, Evapotranspiration, Water requirements, *Nebraska.
Identifiers: Evapotranspiration ratio.

Consumptive use of water by alfalfa grown under two phosphorus fertility levels was measured in a 3-year study in western Nebraska. Soil moisture to a depth of 230 cm was measured with a neutron moisture meter at the start of the growing season, after each cutting, and after the last harvest. Irrigation water was delivered to the benches through an underground pipe and measured before flood irrigation. Alfalfa used 11.4 cm water per metric ton (4.95 in/T) of 88% dry matter hay. Alfalfa used water more efficiently in early May and June than July and August. Average water use per day was 4.1 mm (0.16 in) for the first harvest, 5.6 mm (0.22 in) for the second harvest, and 5.9 mm (0.23 in) for the third harvest. Average evapotranspiration ratios for the 3-year period were 540 for the first cuttings, 630 for the second cuttings, and 860 for the third cuttings. The average evapotranspiration ratio for the three harvest over the 3-year period was 680. Two levels of phosphorus applied to the soil did not alter water use nor total yields of hay. (Skogerboe-Colorado)
W73-04925

INFLUENCE OF ROW SPACING, IRRIGATION, AND WEEDS ON DRYLAND FLAX YIELD, QUALITY, AND WATER USE,
Agricultural Research Service, Mandan, N. Dak.
J. Alessi, and J. F. Power.
Agronomy Journal, Vol 62, No 5, p 635-637, 1970. 2 fig, 2 tab, 14 ref.

Descriptors: *Supplemental irrigation, Irrigation, Weed control, Crop production, Water conservation, *Consumptive use, Seasonal, Irrigation effects.
Identifiers: Flaxseed quality, *Row spacing, *Flax (Linum usitatissinum L.).

Field experiments were conducted during 1966 and 1967 at Mandan, N.D. to evaluate the effects of row spacing (7.5, 15, and 30 cm), irrigation water at fruiting, and weed competition (primarily from Setaria virilis) on water use by flax (linum usitatissinum L.). An irrigation of 50 mm at the fruiting stage increased flaxseed yields only when weeds were controlled, particularly in the dry year of 1967. Flaxseed yields increased as row spacing narrowed from 30 to 7.5 cm only on unweeded plots. Weed growth reduced flaxseed yields for the 2-year period from 26 to 53%, with the least reduction from 7.5-cm row spacing. Midsummer rains or supplemental water at fruiting was less effective in increasing flaxseed production when weeds were present, but some degree of weed control was achieved with narrower row spacing. Oil content of flaxseed was not affected by treatments, but iodine number was slightly higher for the wider spacing (30 cm) in 1966. Total water use was not affected by row spacing or weed treatment, but water use efficiency was increased by narrow row spacing and by weed control. Water use patterns indicated deeper root penetration during the drier year. (Skogerboe-Colorado)
W73-04926

ADSORPTION AND TRANSPORT OF AGRICULTURAL CHEMICALS IN WATERSHEDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 05B.
W73-04927

SURFACE WATER QUALITY IS INFLUENCED BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Morris, Minn. Central Soil Conservation Research Center.
For primary bibliographic entry see Field 05B.
W73-04928

A MODEL OF A GROWING PASTURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Meteorological Physics.
For primary bibliographic entry see Field 04A.
W73-04933

THE EFFECT OF INTAKE EQUATIONS ON THE DEVELOPMENT OF THE WATER ADVANCE EQUATIONS FOR SURFACE IRRIGATION,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-04964

LEAD CONTAMINATION OF SOME AGRICULTURAL SOILS IN WESTERN CANADA,
Department of Agriculture, Agassiz (British Columbia). Research Station.
For primary bibliographic entry see Field 05B.
W73-04965

CONTAMINATION OF ROADSIDE SOIL AND VEGETATION WITH CADMIUM, NICKEL, LEAD, AND ZINC,
Agricultural Research Service, Beltsville, Md. Soils Lab.
For primary bibliographic entry see Field 05B.
W73-04966

RELATIONSHIP OF AUTOMOTIVE LEAD PARTICULATES TO CERTAIN CONSUMER CROPS,
California Univ., Riverside. Air Pollution Research Center.
For primary bibliographic entry see Field 05B.
W73-04968

AUTOMATIC FURROW IRRIGATION SYSTEMS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
A. S. Humpherys.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 1 p 466-470, January, 1971. 7 fig, 2 tab, 18 ref.

Descriptors: *Irrigation practices, Furrow irrigation, *Automation, Irrigation engineering, Surface irrigation, Distribution systems, Irrigation design, Ditches.

One method for automating furrow irrigation systems is to place furrow tubes on grade in the ditch and then control the head, using time controlled check structures. An evaluation of two such systems showed that cutback stream flow was sensitive to head variations caused by varying supply flow and furrow inlet elevation errors. To minimize these variations, furrow tubes or inlet openings should be installed as close to design elevation as possible and the system operated at the design flow rate. Labor requirements can be reduced as much as 90 percent using semiautomated systems. (Skogerboe-Colorado State)
W73-04971

CONTROL OF SOIL MOISTURE DURING SPRINKLER IRRIGATION,
Utah State Univ., Logan.
J. Keller.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 6, p 885-890, June, 1970. 6 fig, 2 tab, 18 ref.

Descriptors: *Soil physics, *Irrigation practices, *Irrigation engineering, *Sprinkler irrigation, Infiltration rates, Drainage, *Soil moisture.
Identifiers: *Soil-water relationships, Application rate.

A laboratory experiment was carried out on 6-in. by 20-in. long columns of four different soils and a sand. The soils tested were a loamy sand, a silty clay loam, and two similar silt loams. Water was uniformly applied to the soil columns which were supplied with controlled drainage and the tests were conducted on several columns of each soil packed at various initial bulk densities. From the information presented the basic infiltration rate

and the degree of saturation associated with various application rates can be estimated for the soil at any bulk density. (Skogerboe-Colorado State)
W73-04972

CROP RESIDUE DISPOSAL-TILAGE-PLANTING RELATIONSHIPS,
Agricultural Research Service, State College, Miss.
R. F. Colwick, J. W. Jones, and F. E. Fulgham.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 1, p 114-120, January, 1971. 15 fig, 7 tab, 6 ref.

Descriptors: *Crop production, *Planting management, *Cotton, *Waste disposal, Degradation (Decomposition).
Identifiers: Crop residue, Tillage.

Cotton plant residue is a waste product that must be managed so that it causes a minimum amount of interference with the cultural operations for the succeeding crop. This study was designed to determine the relationship of residue size, plant part, soil type and depth of soil incorporation to the strength of decomposed residue at planting and to determine the influence of residue size on planter performance. Decomposition was measured by the decrease in peak force and energy required to break sample pieces that had been weathering at several depths through the winter months. Residue left on the soil surface decayed the least, and was significantly stronger than residue placed at other depths. There was a tendency for better decomposition at the 4-in. depth of burial than at 2-in. and 6-in., but there were no differences in decayed strength due to length of pieces or soil type. (Skogerboe-Colorado State)
W73-04973

AIR AS A SOURCE OF LEAD IN EDIBLE CROPS,
Ethyl Corp. Research Labs. Ferndale, Mich.
For primary bibliographic entry see Field 05B.
W73-04975

HOW TO RECYCLE RUNOFF,
For primary bibliographic entry see Field 05D.
W73-04977

STRESS DAY INDEX TO CHARACTERIZE EFFECTS OF WATER STRESS ON CROP YIELDS,
Texas A and M Univ., College Station.
E. A. Hiler, and R. N. Clark.
Transactions of the ASAE, Vol 14, No 4, p 757-761, April, 1971. 2 fig, 2 tab, 28 ref.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Plant growth, Soil water, Soil physics, Irrigation engineering, *Crop production.
Identifiers: *Stress day index, Irrigation scheduling.

Quantitative characterization of water stress in crops with stress day index (SDI) and its effect on crop yields are discussed. The SDI is determined from a stress day (SD) factor and a crop susceptibility factor (CS). The SD factor is a measure of the degree and duration of plant water deficit. The CS factor indicates the plant's susceptibility to water deficit at various growth stages. Alternative approaches to determination of SD and CS are given. Relationships between SDI and yield are determined from results of grain sorghum and peanut irrigation experiments. Various applications of the SDI concept are discussed briefly. (Skogerboe-Colorado State)
W73-04984

SQUARE-MATIC LATEKALLY...NEW CONCEPT IN SPRINKLER IRRIGATION ACHIEVES GOALS LONG SOUGHT BY FARMERS.

Irrigation Journal, Vol 21, No 2, p 10-11, March-April, 1971. 1 fig.

Descriptors: *Sprinkler irrigation, *Irrigation practices, *Automation, Distribution systems, Crop production.
Identifiers: *Automatic irrigation, Continuous-move systems.

An entirely new concept in sprinkler irrigation has been announced by R. M. Wade and Company, manufacturer of Wade Rain. The new system, called 'Square-Matic', is a continuously moving lateral irrigation line which automatically irrigates square or rectangular fields. The system consists of 660 ft. of 5 inch rubber hose, 1/4 mile of aluminum line supported by 16 individually controlled drive towers and a winch cart. Travelling 1320 feet in 12 to 48 hours, depending on crop needs, the system can apply 1/2 to 2 inches of water uniformly to a 40 acre tract. Advantages of the system include no wasted land in the corners, uniform, low application rates, and no increase in application rate from one end of the line to the other. (Skogerboe-Colorado State)
W73-04985

WATER LOSSES DURING SPRINKLING,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
I. Seginer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 4, p 656-664, April 1971. 7 fig, 3 tab.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Evaporation, Distribution systems, Irrigation systems, Water loss, Meteorology.

Water losses during sprinkling were determined for various meteorological and operation conditions. The regression lines of total loss on solar radiation, for the various operation conditions were practically parallel to each other, with slope of about 0.5. The minimum loss was for a treatment where the surface was wet but no drops were in the air. As the number of drops in the air increased and their size decreased, the total loss increased. From a theoretical analysis based on a simple resistance model it seems that spray evaporation was negligible relative to drift loss in this case. (Skogerboe-Colorado State)
W73-04986

EVAPOTRANSPIRATION AND DRAINAGE FROM THE ROOT ZONE OF IRRIGATED COASTAL BERMUDAGRASS (CYNODON DACTYLON L. PERS.), ON COASTAL PLAINS SOILS,
Agricultural Research Service, Thorsby, Ala. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W73-04987

SIMULATION VERSUS EXTREME VALUE ANALYSIS IN SPRINKLER SYSTEM DESIGN,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
E. C. Stegman, and A. M. Shah.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 3, p 486-491, March 1971. 5 fig, 7 tab, 8 ref.

Descriptors: *Irrigation practices, *Sprinkler irrigation, Design, Irrigation engineering, Climatic data, Computer models.
Identifiers: *Extreme value theory, *Peak use rate.

Climatic data of 37 years for Oakes, North Dakota were analyzed according to Gumbel extreme value theory. The extreme value distributions of these parameters were then used to estimate probabilities of inadequacy to be expected for design-peak use rates of varying magnitudes. A water-balance model was designed to simulate the operation of specific sprinkler-system types. The model was applied to the selected 37-year period, thus, identical sets of ET data were utilized in both analyses. The simulated rates were then compared with the peak use pumping rates. It appears that extreme-value distributions of either ET or net evaporation rates will provide conservative estimates of design peak use rates in subhumid and humid areas. (Skogerboe-Colorado State)
W73-04991

LAND GRADING FOR IMPROVED SURFACE DRAINAGE,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-04992

QUALITY SURFACE IRRIGATION RUNOFF WATER,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 05B.
W73-04993

SEASONAL VARIATION OF HYDRAULIC PARAMETERS AND THEIR INFLUENCE UPON SURFACE IRRIGATION APPLICATION EFFICIENCY,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, and E. C. Stegman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 5, p 914-923, May 1971. 10 fig, 4 tab, 11 ref.

Descriptors: *Irrigation practices, *Fluid mechanics, *Open channels, Open channel flow, Roughness (Hydraulic).
Identifiers: *Furrow design, Furrow flow.

This study was conducted in two parts: (a)A field investigation was made to observe and characterize the seasonal hydraulic behavior of a farm-size irrigated unit, and (b) an analysis was made of the relative influence of several parameters on water application efficiency. Physical factors observed in the field included infiltration rate and retardance coefficient variations with irrigations and season. Small grains and alfalfa were irrigated by graded borders and potatoes by graded furrows. The hydraulic behavior of the system was mainly influenced by a decreasing infiltration rate with successive irrigations. Large increases in required infiltration opportunity time occurred from the first to second irrigation in each crop. These increases diminished with successive irrigations and approached near constant values at about the fourth irrigation. (Skogerboe-Colorado State)
W73-04996

OPERATION OF IRRIGATION SYSTEMS OUTSIDE THE GROWING SEASON,
G. V. Voropayev.
Soviet Hydrology: Selected Papers, No 1, p 80-88, 1970. 6 fig, 4 tab.

Descriptors: *Irrigation systems, *Irrigation operation and management, *Surface irrigation, Irrigation practices, Water management, Distribution systems, Leaching, Winter.
Identifiers: *Winter operation.

The possibility of operating an irrigation system under severe winter conditions was evaluated. The area selected was in the Soviet Union with winter temperatures below -10 degrees. The purpose was to see if it was desirable to add additional irrigation and leaching water during the winter months. This method worked satisfactorily if the irrigation

method used was equally efficient at adding water to the soil or forming surface ice layers. (Skogerboe-Colorado State)
W73-04998

A MODIFIED INFLOW-OUTFLOW METHOD OF MEASURING INFILTRATION IN FURROW IRRIGATION,
Soil Conservation Service, Columbia, S.C.
L. A. Nance, Jr., and J. R. Lambert.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 6, p 792-798, June 1970. 9 fig, 7 ref.

Descriptors: *Irrigation practices, *Infiltration, *Percolation, Permeability, Hydraulic conductivity, *Furrow irrigation.
Identifiers: Intake rates.

A modified inflow-outflow method for calculating infiltration is described. Five tests of the method were made. Three were made simultaneously with the modified Bondurant method. All of the tests were made within a 0.3-acre plot of ground with most of the test sites adjoining one another. The method was found feasible for measuring infiltration rates for furrow irrigation. It approximated the furrow irrigation process, was easy to control in the field, required preparation of only three 15-foot furrows, and yielded satisfactory data. The system was capable of operating over a large range of flow rates. (Skogerboe-Colorado State)
W73-05000

A PRIMER ON AGRICULTURAL POLLUTION, SUMMARY,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 05B.
W73-05002

ELECTRIC CONTROLS FOR AUTOMATIC SURFACE IRRIGATION SYSTEMS WITH REUSE SYSTEM,
Nebraska Univ., Lincoln.
P. E. Fischbach, T. L. Thompson, and L. E. Stetson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 3, p 286-288, March 1970. 10 fig, 3 ref.

Descriptors: *Irrigation practices, *Irrigation systems, *Automation, Electrical equipment, Water conservation, *Water reuse.
Identifiers: Electric controls, Reuse system.

The equipment and controls needed for an automatic surface irrigation system, including reuse of the runoff water are described. The system described was installed in 1966 and had been operating for three years. In designing the system the following points should be kept in mind. The electric controls should be simple, reliable, and provide protection for the electric motors and irrigation equipment. They should include controls to start the system, time the irrigation, change the water from one set to another, recycle the runoff water, and shut the system off. Schematic drawings of each part of the system are presented and discussed. The use and care of the system are also considered. (Skogerboe-Colorado State)
W73-05007

CROP PRODUCTION SYSTEM SIMULATION,
Arizona Univ., Tucson. Dept. of Agricultural Engineering.
H. N. Stapleton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 1, p 110-113, January 1970. 11 fig, 15 ref.

Descriptors: *Mathematical models, *Computer models, Crop production, *Cotton, Model studies, *Simulation analysis, *Computer program.
Identifiers: Growth simulation.

A model and the computer program for the crop subsystem are described. Attempt was made to develop a model which could be forced to provide numerical values for system effects prior to end of season yield. This information aids in the planning and decision making processes necessary for farming operation. A discussion of the needed input along with the flow charts of the program is presented. In its present state the program is designed to work only with cotton. (Skogerboe-Colorado State)
W73-05008

MOVEMENT OF AGRICULTURAL FERTILIZERS AND ORGANIC INSECTICIDES IN SURFACE RUNOFF,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 05B.
W73-05009

ONE APPROACH TO IRRIGATION MODELING UNDER RISK,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
D. V. Smith.
Water Resources Bulletin, Vol 8, No 6, p 1225-1234, December, 1972. 46 equ, 21 ref.

Descriptors: *Irrigation, *Planning, *Water suppiy, *Stochastic processes, *Linear programming, *Optimization, Water demand, Water balance, Wells, Canals, Rainfall, Streamflow, Mathematical models, Systems analysis.
Identifiers: *Uncertainty, *Water deficits, *Risk levels, Cropping patterns, Chance-constrained programming.

To demonstrate the strengths and weaknesses of stochastic programming with recourse, a problem in irrigation planning is considered. It is based upon a deterministic planning model and a series of stochastic planning models that build upon a project area water balance, to evaluate the irrigated area to be developed, the cropping pattern to be selected, and the required capacities of the well and canal systems; it is assumed that there is no surface reservoir storage of water. Stochastic programming with recourse is shown to have considerable potential for modeling a complex irrigation problem under conditions of random rainfall and streamflow. Its utility will grow as computational techniques are improved for solving multistage stochastic programming with recourse problems, and as agronomists provide the necessary loss functions for water deficits. (Bell-Cornell)
W73-05052

IRRIGATION THROUGH SUBSURFACE DRAINS,
North Carolina State Univ., Raleigh.
R. W. Skaggs, G. J. Kriz, and R. Bernal.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers; Vol 98, No IR3, p 363-373, Sept 1972. 8 fig, 11 ref, append.

Descriptors: *Subsurface irrigation, *Theoretical analysis, On-site investigations, Hydraulic conductivity, Subsurface drains, Groundwater movement, Permeability, Irrigation systems, Evapotranspiration, Soil water movement, Drainage effects, Steady flow, North Carolina, Impervious soils, Water table, Irrigation, Loam.
Identifiers: *Drain spacing, Sandy loams, Tile spacing.

Subirrigation aims at raising and maintaining the water table to a level sufficient to supply the water needs of a crop. Management of the water table is dependent upon: (1) an impermeable layer or a permanent water table at shallow depth to minimize seepage losses; (2) topography nearly flat so that the supply is uniformly available in a field; and (3) soil having a high hydraulic conductivity. Feasibility of subirrigation was investigated on 12 tile lines 12.5 cm in dia, in sets of 4, with 7.5 m, 15 m, and 30 m spacings. The soil was 20-30 cm of sandy loam underlain by a tight clay layer. Results showed that water could be supplied successfully for all but the 30 m spacing. Theory showed that a water table 30 cm above the tile could be maintained midway between lines with a spacing of 19.2 m. An equation was derived for upward movement of the water table during the early stages of subirrigation. Comparisons with field tests showed the equation to be accurate for predicting the rise midway between tile lines. (USBR)
W73-05061

EFFECTS OF WATER STRESS, CANE SIZE AND GROWTH REGULATORS ON FLORAL PRIMORDIA DEVELOPMENT IN RED RASPBERRIES,
Washington State Univ., Pullman.
P. C. Crandall, and J. D. Chamberlain.
J Am Soc Hortic Sci, Vol 97, No 3, p 418-419, 1972.
Identifiers: Cane size, *Floral primordia, Growth, Hydrazides, *Raspberries-D, Regulators, Succinic-Acid, Water stress.

Factors that are usually associated with the slowing of primocane growth during late summer hastened the appearance of floral primordia in red raspberry axillary buds. Of the factors tested, water stress was most effective in advancing floral primordia appearance. Small diameter canes had buds more advanced than thick canes. July applications of succinic acid-2,2-dimethylhydrazide (SADH) at 2000 and 4000 ppm and (2-chloroethyl)phosphonic acid (ethephon) at 500 ppm increased the number of blossom primordia present during early Oct. Growth regulators had no significant effect on yields.--Copyright 1972, Biological Abstracts, Inc.
W73-05086

PRODUCTION OF CUT-FLOWERS ON SUB-IRRIGATED MULCHED BEDS WITH A SINGLE PRE-PLANT FERTILIZER APPLICATION,
Agricultural Research and Educational Center, Bradenton, Fla.
J. C. Raulston, and C. M. Geraldson.
Proc Fla State Hortic Soc. 84. p 403-407. 1971.
Identifiers: Ethylene, Fertilizer, *Flowers, Irrigation, *Mulch, Mulched beds, *Osmocote, Production, Snapdragon-D, Statice-D.

Chrysanthemums, snapdragons and statice were successfully grown on saranhouse ground beds which received single applications of 6-8-8 dry fertilizer or 14-14-14 (Osmocote) at rates of 300-900 pounds N/acre on the soil surface prior to mulching and planting. Polyethylene and paper mulches were evaluated and treatments were compared with non-mulched plots receiving weekly liquid or dry fertilizer applications. Osmocote produced plants equivalent to 6-8-8 dry fertilizer and 20-20-20 liquid fertilizer when used at comparable rates and satisfactory crops were produced by all fertilizer materials with and without mulching.--Copyright 1972, Biological Abstracts, Inc.
W73-05087

THE EFFECT OF PRECIPITATION OF MATURITY PARAMETERS OF FLORIDA CITRUS,
Florida Univ., Lake Alfred. Citrus Experiment Station.
R. D. Carter, B. S. Buslig, and J. A. Attaway.
Proc Fla State Hortic Soc. 84. p 92-95. 1971.
Identifiers: *Acidity, *Brix, *Citrus-D, Florida, Maturity, *Precipitation, Yield.

Annual precipitation records at 10 representative USA Weather Bureau locations throughout the citrus producing area of Florida were studied from 1952 through 1970. Seasonal averages of fruit acidity, Brix and yields as reported by the Florida Department of Agriculture and the Florida Can-

ners Association were correlated with the precipitation data. Correlation was found between precipitation and maturity in terms of acidity (r ± -.83) and Brix (r± -.83) of grapefruit.--Copyright 1972, Biological Abstracts, Inc.
W73-05088

SALINIZATION AND ALLELOPATHIC CONTAMINANTS OF SUBSTRATES IN HYDROPONICS AND THEIR ELIMINATION, (IN RUSSIAN),
E. A. Aliev, A. G. Kadysh, and V. I. Piontkovskii.
Agrokhimiya. 9, p 93-98. 1971.
Identifiers: Acids, *Allelopathic contamination, Chemical, Contaminants, *Hydroponics, Oxidizers, Regeneration, *Salinization.

The prolonged use of the substrate results in its salinization and contamination by root remains and root excretions, adversely affecting growth and reducing plant yield. Chemical regeneration of the substrate with strong oxidizers and acids improves its quality.--Copyright 1972, Biological Abstracts, Inc.
W73-05143

ORIGIN OF TRANSPIRATION WATER AND PATHWAYS OF HEAVY WATER (D2O) MOVEMENT IN LEAF TISSUES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii.
V. Z. Kotlyar, M. A. Lyubyns'kyi, and P. S. Kirnos.
UKR Bot Zh. Vol 27, No 6, p 776-778, 1970, English summary.
Identifiers: Auto, Bean-D, Cucumber-D, Deuterium, Epidermis, *Heavy water, Horse bean, Leaf, Mesophyll, Oxides, Pepper-D, Radiography, Roots, Tissues, *Transpiration water.

Deuterated water was introduced through the roots of horse bean, red pepper and cucumber, and at definite intervals the deuterium content was determined in transpiration water from the upper and lower sides of leaf blades and in the tissues of the upper and lower epidermis and of the mesophyll. The content, 23 and 30 hr after immersion of plant roots in labeled water, as a rule, was higher in transpiration water than in the water of leaf tissues. It is concluded that the water of the transpiration stream moves in free space, i.e., outside of the protoplasts.--Copyright 1972, Biological Abstracts, Inc.
W73-05165

ROLE OF CALLOSE IN PLANT ANTHERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
E. I. Barskaya, and N. V. Balina.
Fiziol Rast. Vol 18, no 4, p 716-721, 1971, Illus, English summary.
Identifiers: *Anthers, Atmospheric drought, *Bean-D, Buds, *Callose, Dehydration, Drought, Flowers, Microscopy, Plants, Ploidy, Sporogenesis.

The effect of atmospheric drought on microsporogenesis was studied in bean plants. Young flower buds from the plants grown under optimal conditions and from plants grown under drought conditions were subjected to a comparative microscopic analysis. Drought caused considerable damage to the reproductive cells which were not protected by callose; it did not dehydrate the tetrad cells contained in the callose 'capsules.' Reproductive (haploid) cells were more sensitive to drought than somatic (diploid) cells. Callose in plant anthers is concluded to be not only a source of carbohydrates for developing microspores but a means of protection of reproductive cells from dehydration.--Copyright 1972, Biological Abstracts, Inc.
W73-05167

TRICKLE IRRIGATION ('REGA GOTICULAR') (IN FRENCH),
Mozambique Univ., Lourenco Marques. Dept. of Agronomy.
F. R. Cunha.
Rev Cienc Agron Ser B. Vol 3, No 1, p 15-28. 1970.
Identifiers: Irrigation, Plants, *Trickle irrigation, *Israel.

The principles and objectives of the trickle or drip irrigation applied for the first time in Israel are presented. The essential infra-structures of the method and some trials carried out both in Israel and Australia are described as well as some commercial applications. Its advantages over the furrow, sprinkler and flood irrigations in poor, coarse and salty soils are pointed out. Emphasis is put on plant water requirements by the use of the trickle irrigation through the studies of water circulation in the soil-plant-atmosphere system. The application of this new irrigation system in Mozambique is suggested.--Copyright 1972, Biological Abstracts, Inc.
W73-05171

METHODS FOR EVALUATING WATER NEEDS IN AGRICULTURE: PART I. TERMS OF THE HYDRAULIC EVALUATION DEPENDING ON THE PLANT LIFE AND CLIMATE,
Institut National de la Recherche Agronomique, Toulouse (France). Station d'Agronomie.
J-R. Marty.
Bull Assoc Fr Etud Sol. (1) p 31-40. 1970. Illus.
Identifiers: *Agriculture, Climate, Evaluation, Methods, Moisture, Plant, Reserves, Soils, Transpiration, *Water demands.

The climatic deficit varies from 1 yr to another. To establish the water requirement, the water reserves in the soil which can be used by the plant must be considered. Various formulas based on climatic and geographic factors, crop coefficients, energy estimation and evapotranspiration, are explained.--Copyright 1972, Biological Abstracts, Inc.
W73-05172

INFLUENCE OF CROPS ON THE WATER STABILITY OF THE SOIL (IN CZECH),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
For primary bibliographic entry see Field 02G.
W73-05176

DRAINAGE NEEDS OF RICE,
Indian Agricultural Research Inst., New Delhi.
V. K. Vamadevan, and N. G. Datane.
Acta Agron Acad Sci Hung. Vol 21, No 1/2, p 69-73. 1972. Illus.
Identifiers: *Drainage, Growth, *Rice-M, Crop yields.

In greenhouse studies on drainage, it was observed that surface as well as vertical drainage treatments were at par but were both superior to no drainage treatment in their effect on grain and straw yields. Better growth of plants in both drainage treatments could be attributed to a greater number of productive tillers and larger ear heads.--Copyright 1972, Biological Abstracts, Inc.
W73-05177

HYGROSCOPIC CHARACTERISTICS OF HARD SEEDS (IN RUSSIAN),
A. M. Ovesnov.
Uch Zap Perm Univ. 206, p 89-95. 1970.
Identifiers: Germination, Hygroscopic studies, Lathyrus-Vernus-D, Melilotus-D, Moisture, Seeds, Temperature, Vicia-D, *Bean seeds, *Hilum.

Desorption in hard bean seeds is regulated by the hilum. Hard seeds usually give off water, but absorb it in a gaseous state under the following conditions: after a sufficiently great loss of water; during long term activity of positive low temperatures in a moist atmosphere. The germination of hard seeds in nature is determined by the effect of ecological conditions to which they react with the activity of the hilum. Results of experiments from Vicia, Melilotus and Lathyrus vernus are given.--Copyright 1972, Biological Abstracts, Inc.
W73-05180

EFFECT OF FERTILIZERS ON THE YIELD AND QUALITY OF SPRING WHEAT GRAIN UNDER CONDITIONS OF IRRIGATION (IN RUSSIAN),
Volgograd Agricultural Inst. (USSR).
V. Y. Popov.
Agrokhimiya. 2. p 64-67. 1971.
Identifiers: Fertilizers, Grain, Irrigation, *Nitrogen, *Phosphorus, *Wheat-M, Crop yield.

The application of N90P80 makes it possible to obtain a yield of irrigated durum spring wheat of 35-40 centners/ha. The water content of the soil should be kept at a level of 75-80% of field water capacity until the phase of waxy ripe grain. Applying N fertilizers at 3 different times (at the time of plowing under, during tillering and during grain formation) increases the protein content in the grain of irrigated durum spring wheat as high as 16-17%.--Copyright 1972, Biological Abstracts, Inc.
W73-05191

GROWTH RATE OF VEGETATIVE ORGANS AND EARS IN SOME CEREALS DURING THE CRITICAL PERIOD OF WATER DEFICIENCY IN THE SOIL (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR).
O. B. Motkalyuk, and N. N. Savitskaya.
Fiziol Rast. Vol 18, No 6, p 1213-1218. 1971. English summary.
Identifiers: *Barley-M, Cereals, Deficiency, *Growth rates, Period, *Rye-M, Soils, *Wheat-M.

The rate of growth in barley, wheat and rye was studied under optimal conditions (field experiments) and under conditions of water deficiency (vegetative experiments). The development of pollen was studied during plant growth. The period of greatest growth of all plant parts coincided with the period of highest sensitivity to dehydration (meiosis-uninuclear pollen). The lowest crop during drought in this period was accompanied by the strongest inhibition of growth processes.--Copyright 1972, Biological Abstracts, Inc.
W73-05194

BACKGROUND OF NITROGEN NUTRITION AND IRRIGATION REGIME OF NIGHTSHADE (IN RUSSIAN),
V. V. Kurnosov, P. T. Kondratenko, L. A. Pikova, and L. D. Ustimova.
Agrokhimiya. 10. p 20-23. 1971.
Identifiers: Irrigation, *Nightshade-D, *Nitrogen, Nutrition, Phosphorus, Regime, Solanum-Laciniatum-D.

In field experiments with nightshade (Solanum laciniatum Ait.) growing on irrigated sierozem, the pre-sowing application of N (40 kg/ha) and P (60 kg/ha) was very effective when combined with a 3-fold N supplement of 30-60 kg/ha during the vegetative period and with sufficient irrigation.--Copyright 1972, Biological Abstracts, Inc.
W73-05195

EFFECT OF PLACEMENT OF NITROGENOUS FERTILIZER ON BROWN SARSON (BRASSICA CAMPESTRIS L. VAR. DICHOTOMA WATT) GROWN UNDER RAIN-FED CONDITIONS,
Haryana Agricultural Univ., Gurgaon (India). Research Farm.
B. P. Singh, A. L. Bhola, Kanwar Singh, and T. P. Yadava.
Indian J Agric Sci. Vol 41, No 10, p 827-830. 1971.

Identifiers: Brassica-Campestris-Var-Dichotoma-D, Fed, *Fertilizer, Grain, India, *Nitrogen, Rain, *Sarson-D.

The effect of placement of nitrogenous fertilizer under rain-fed conditions on brown sarson (B. compestris L. var. dichotoma Watt) was studied at Gurgaon (India) during 1968-1970. The treatment where fertilizer was applied 15 cm deep gave significantly more grain yield than the treatment where half the fertilizer was drilled 8 cm deep at the time of sowing and the other was applied 15 cm deep.--Copyright 1972, Biological Abstracts, Inc.
W73-05196

EFFECT OF FERTILIZER ON PHOTOSYNTHESIS, RADIATION REGIME, AND TRANSPIRATION OF COTTON (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Pochvovedeniya i Agrokhimii.
S. A. Aliev, and N. M. Rzaev.
Agrokhimiya. 9. p 88-92. 1971. Illus.
Identifiers: *Cotton-D, *Fertilizer, Photosynthesis, Radiation, Regime, Transpiration.

Diurnal and seasonal changes of the intensity of solar radiation are the main factors influencing productive photosynthesis and utilization of energy. The productive photosynthesis of cotton reaches comparatively high values at a total radiation up to 3000 cal/dm2/hr, but decreases with a further increase of radiation to 8500 cal/dm2. The application of N90P90K45 and of mulch at a rate of 10 tons/ha increased the productive photosynthesis of cotton and the utilization of solar radiation for photosynthetic processes. An inverse relation was noted in daytime photosynthesis and transpiration: an increase of transpiration was accompanied by a drop of productive photosynthesis and vice versa.--Copyright 1972, Biological Abstracts, Inc.
W73-05197

ROOT LENGTH AND VAPOR PRESSURE DEFICIT: EFFECT ON RELATIVE WATER CONTENT IN ZEA MAYS L.,
New South Wales Dept. of Agriculture, Leeton (Australia). Agricultural Research Station.
L. A. Downey, and T. C. Mitchell.
Aust J Biol Sci. Vol 24, No 4, p 811-814. 1971. Illus.
Identifiers: Absorption, Deficit, *Irrigation efficiency, Length, Potential, Pressure, *Root systems, Soils, Transpiration, Turgidity, Vapor pressure, Corn (Field).

This investigation was undertaken to answer the question of whether or not a plant grown under irrigated conditions really needs an extensive root system. The results show that even when the soil matric potential was maintained at field capacity a severe atmospheric demand (VPD (vapor pressure deficit) > 70 mb) caused a significant drop in relative water content, i.e., there was a lag between transpiration and absorption. When only 25% of the root system was maintained at field capacity the plants were unable to maintain turgidity at a VPD greater than 40 mb. It is concluded that in conditions of high evaporative demand there are advantages in a large root system.--Copyright 1972, Biological Abstracts, Inc.
W73-05198

DIURNAL FLUCTUATION AND RELATIVE MAGNITUDE OF WATER POTENTIAL IN WHEAT TISSUE,
Taiwan Sugar Experiment Station, Taipei.
S. J. Yang, and E. DeJong.
Can J Plant Sci. Vol 51, No 4, p 333-336. 1971.
Identifiers: Diurnal fluctuation, Humidity, Leaves, Light, Magnitude, Moisture, Root, *Soil moisture, Stem, Temperature, *Wheat-M.

The results demonstrate that plant water potential is affected by changes in soil moisture, aerial environment (air temperature, relative humidity, light) time and tissue (leaves of different position, stem and root) being considered. Because of these variations, it is important that the same tissue be compared at the same time, e.g., just before sunrise or early in the afternoon. The need for a fixed sampling time seems to increase with increasing variability of the aerial environment.--Copyright 1972, Biological Abstracts, Inc.
W73-05199

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

INCREASING WATER SUPPLIES BY SUPPRESSION OF RESERVOIR EVAPORATION,
Oklahoma Water Resources Research Inst., Sillwater.
For primary bibliographic entry see Field 03B.
W73-04558

THE BALDWIN HILLS RESERVOIR FAILURE IN RETROSPECT,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 08A.
W73-04569

SEISMIC EFFECTS OF RESERVOIRS,
For primary bibliographic entry see Field 08E.
W73-04570

CATTLE FEED FROM MESQUITE WOOD,
For primary bibliographic entry see Field 03F.
W73-04587

AN INITIAL ASSESSMENT OF MAMMAL DAMAGE IN THE FORESTS OF THE SOUTHWEST,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
L. J. Heidmann.
USDA Forest Service Research Note RM-219, 1972. 7 p, 8 fig, 2 tab, 6 ref.

Descriptors: *Mammals, *Wildlife management, *Planting management, *Soil management, Revegetation, Damages, Animal control, Forest management, Range management, Watershed management, Livestock, Wildlife, Southwest U.S., Arizona, New Mexico, Trees, Planning, Surveys, Evaluation, Soil erosion, Rodents, Soil conservation, Reforestation, Ruminants.

Mammal damage of trees is a serious problem in some forests of the Southwest. All size classes of trees are affected, but the problem is most important in plantations and stands of young trees. In addition, mammals are a major factor in preventing the establishment of regeneration on one-half million acres of nonstocked forest land in the Southwest. In order to assess the mammal damage to forests in Arizona and New Mexico, a questionnaire was sent to various forest managers during the summer of 1970. Respondents were asked to estimate how many acres of forest trees were being damaged, which mammals were responsible, and what percent of the trees on these acres were being damaged. Results indicate that over 1 million acres of commercial forest in the Southwest are subject to mammal damage, and that most of this damage occurs on the 7.5 million acres of commercial ponderosa pine. The most extensive acreages involved in both states support sapling and pole stands where damage is caused primarily by procupines. Mice and voles were also frequently blamed for regeneration failures. In Arizona, the most extensive damage in regeneration attempts was attributed to gophers and other rodents. The importance of mammal damage considerations in forest management is stressed. (Black-Arizona)
W73-04597

AMERICAN MYTH: DESERT TO EDEN: THEORIES OF INCREASED RAINFALL AND THE TIMBER CULTURE ACT OF 1873,
Montana Univ., Missoula. Dept. of History.
D. M. Emmons.
Forest History, Vol 15, No 3, p 6-14, Oct 1971, 3 fig, 37 ref.

Descriptors: *Great Plains, *Deserts, *Forests, *History, *Hydrologic aspects, Arid lands, Trees, Rainfall, Cultivated lands, Railroads, Land management, Meteorology, Droughts, Legal aspects, Investigations.

The Timber Culture Act of 1873 states that 'any person who shall plant, protect, and keep in a healthy growing condition for ten years forty acres of timber, the trees there on not being more than twelve feet apart each way on any quarter section of any of the public lands...shall be entitled to a patent for the whole of said quarter-section...' The sterility, desolation and aridity of the Great Plains, it was thought by 1870, made it irreclaimable for agriculture. The plains served as a home for 'wandering and uncivilized aborigines,' and a release from eastern industrial society. It was hoped that rainfall could be increased on the Plains by railroad tracks and telegraphs, irrigation works, or forestation. Historical development of forestation as a rainfall-increasing agent is discussed. Deforestation, it was thought, produces drought. Various scientific investigations are cited which supported these views. The theory led to the Timber Culture Act, which sought to increase agriculture by increasing moisture availability through forestation, as the American people convinced themselves that they could make it rain. The Act was repealed in 1891, as planted trees did not bring rain. The Act awakened Americans to the consequences of indiscriminate timber cutting and induced wise conservationist practice. The Plains, condemned as desert, restored as garden, were never fully understood, and nowhere is this better revealed than in the 1873 Timber Culture Act. (See also W73-04600) (Popkin-Arizona)
W73-04599

AMERICAN MYTH: DESERT TO EDEN: CAN FORESTS BRING RAIN TO THE PLAINS,
Colorado Univ., Colorado Springs. Div. of Continuing Education.
C. R. Kutzleb.
Forest History, Vol 15, No 3, p 14-21, Oct 1971, 2 fig, 22 ref.

Descriptors: *Great Plains, *Deserts, *Forests, *History, *Hydrologic aspects, Arid lands, Semiarid climates, Trees, Rainfall, Plant growth, Vegetation, Cultivated lands, Railroads, Meteorology, Theoretical analysis, Precipitation (Atmospheric), Variability, Droughts, Frequency, Dry farming, Investigations, Streams, Springs, Kansas, Nebraska.

The 'Great American Desert' was considered irreclaimably sterile because the Great Plains has a semiarid climate and lacked trees. After the Civil War, the plains area was considered the 'Garden of the World' as periods of greater than normal rainfall resulted in the growth of lush vegetation. Common beliefs were that increased rainfall increased cultivated land, so that trees were grown and railroads were extended. A very popular notion during the last half of the 19 centry held that forests increased rainfall. Current meteorological theory states that little if any humanly induced rainfall occurred on the plains in this period, as precipitation in the region west of the Rocky

Mountains between the Canadian and Mexican Borders comes from the Pacific Ocean and the Gulf of Mexico. Extreme variations in rainfall are common in this zone. Periods of above average precipitation, say 1884 through 1887, were accompanied by increased settling of persons as in Kansas and Nebraska, west of the 98th meridian. A European theory held that removal of forests resulted in drought, accompanied by drying up of springs and lowering of streams. Several experiments and field studies are cited in defense of this thesis. Reports of an alleged 'rain tree', which absorbs moisture from air, concentrates it, and pours forth showers from its leaves and branches in South America, are noted. After 1895, the belief could not stand under the scientific investigation against it, acceptance of dry land farming and frequency of droughts. (See also W73-04599) (Popkin-Arizona)
W73-04600

CRITICAL SOIL MOISUTRE LEVELS FOR FIELD PLANTING FOUR-WING SALTBUSH,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Alson.
Journal of Range Management, Vol 25, No 4, p 311-312, July 1972. 2 fig, 7 ref.

Descriptors: *Soil-water-plant relationships, *Limiting factors, *Revegetation, *Planting management, *Vegetation establishment, *Soil stabilization, *Sediment control, Viability, Seed treatment, Seeds, Soil conservation, Soil moisture, Range management, Wildlife management, Moisture stress, Land reclamation, Livestock, Wildlife habitats, Forage palatability.

Recently, much effort has gone into determining methods of establishing fourwing saltbush (Atriplex canescens (Pursh) Nutt.) on devastated areas in need of soil stabilization. It is an excellent soil stabilizer, nutritious all-season forage plant for grazing animals, provides food and cover for wildlife, and traps sediment on alluvial flood plains. Eighty percent survival was attained when fourwing saltbush transplants were planted on alluvial soils containing at least 14 percent soil moisture by weight, or were at tensions between one-third and 2 atmospheres. Findings indicate that it is important to wait until the probability for sizable (.40 inches plus) summer thunderstorms exceeds 50 percent and soil moisture stress is less than 2 atm of tension. For alluvial bottom lands, this is about 13 percent soil moisture. Using native seed for the transplants and placing them at ground level is also important for good survival. (Black-Arizona)
W73-04603

EFFECTS OF WILDFIRE ON TIMBER AND FORAGE PRODUCTION IN ARIZONA,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
H. A. Pearson, J. R. Davis, and G. H. Schubert.
Journal of Range Management, Vol 25, No 4, p 250-253, July 1972. 5 tab, 1 ref, 12 ref.

Descriptors: *Forest management, *Burning, *Revegetation, *Forest fires, *Demonstration watersheds, Range management, Wildlife management, Planting management, Ponderosa pine trees, Arizona, Plant growth, Herbivores, Livestock, Damages, Nutrients, Forage grasses, Pastures.

In 1967, lightning started a wildfire in a ponderosa pine stand north of Flagstaff, Arizona. About 800 acres of pine timber were burned, including two experimental pastures on the Wild Bill Range. Since tree and herbage growth had been measured for 5 years prior, the fire provided an opportunity to evaluate the damage and recovery of the vegetation. Nearly all trees in an unthinned pasture were destroyed, but little reduction in tree density resulted in a heavily thinned pasture. Radial growth increased on burned trees where crown kill was less than 60 percent and decreased where crown kill was more than 60 percent. Burning initially stimulated growth of herbaceous vegetation in both stands, and herbage nutrient value was temporarily enhanced. Artificailly seeding burned areas with orchard-grass and intermediate wheatgrass improved grass production significantly. (Black-Arizona)
W73-04604

EVALUATION OF PLANNING FOR WETLANDS DRAINAGE PROJECTS IN THE SOUTHEASTERN COASTAL PLAINS,
Research Triangle Regional Planning Commission, Research Triangle Park, N.C.
For primary bibliographic entry see Field 06B.
W73-04624

OPERATING POLICIES FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
T. P. Chang, and G. H. Toebes.
Available from the National Technical Information Service as PB-214 590, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center Technical Report No. 31, 1972. 73 p, 13 fig, 6 tab, 27 ref. OWRR A-012-IND (4) and OWRR A-016-IND (2).

Descriptors: *Reservoir operation, *Flood control, *Recreation, *Model studies, Reservoir release, Multiple-purpose reservoirs, Municipal water, Groundwater recharge, Indiana.
Identifiers: Drainage area ratio, Storage volume ratio, *Wabash Basin (Indiana), Huntington Reservoir, Salamonie Reservoir, Mississinewa Reservoir, Lafayette Reservoir, Big Pine Reservoir.

A recently completed computer simulation model for a water management and reservoir system for which it was built is reviewed. This system is the collection of constructed and authorized reservoirs in the Upper Wabash Basin in Indiana. The many uses of such a simulation model are discussed. The value of these uses depends on the goodness of the reservoir regulation rules. The development of two variants of a systems operating policy are presented. The development is set forth in such a manner to facilitate adoption and adaptation by water management professionals. The principle involved, namely that of 'reservoir balancing', is not new and has been used to increase the power production of extensive reservoir systems. Its adaptation to the flood control and recreational function of a system of existing reservoirs is presented. The development is referenced to the existing Corps of Engineers operating policy for the Upper Wabash reservoirs and retains the complexities of that system and its regulation plan. It is anticipated that eventually a regulation policy will be developed which will be practical for the entire Wabash Basin with possibilities for any basin with similar management purposes. (Wiersma-Indiana)
W73-04628

METHOD FOR CALCULATION OF TOTAL BED-LOAD TRANSPORT AT THE MOUTH OF A RIVER,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 02J.
W73-04759

CALCULATION OF RIVER BED DEFORMATION IN UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 02J.
W73-04760

TRANSFORMATION OF DISCONTINUOUS ALLUVIAL WATER COURSES INTO UNIFORM SUBSTITUTE CHANNELS FOR CALCULATING THE SOLID'S DISCHARGE,
Technische Universitaet, Darmstadt (West Germany). Institut fuer Wasserbau und Wasserwirtschaft.
For primary bibliographic entry see Field 02J.
W73-04761

THE INFLUENCE OF AN ISLAND AT THE MOUTH OF A CUTOFF OF A LOOP ON THE DEFORMATION OF THE BED OF WATER COURSE (L'INFLUENCE D'UN ILOT A L'EMBOUCHURE D'UNE COUPURE DE BOUCLE SUR LA DEFORMATION DU LIT D'UN COURS D'EAU).
Robert Coll., Istanbul (Turkey).
For primary bibliographic entry see Field 08B.
W73-04764

A STUDY OF THE OPTIMAL SECTION OF A PILOT CHANNEL FOR A CUTOFF OF A MEANDER (RECHERCHE DE LA SECTION OPTIMALE D'UN CHENAL-PILOTE POUR UNE COUPURE DE MEANDRE)
For primary bibliographic entry see Field 08B.
W73-04765

AN INVESTIGATION OF RIVER BED DEGRADATION DOWNSTREAM OF A DAM,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 08B.
W73-04767

PREDICTION OF RIVER-BED DEGRADATION BELOW DAMS,
Gifu Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04768

DEFORMATION OF ALLUVIAL CHANNEL DOWNSTREAM FROM LARGE HYDRO-PROJECTS,
Universitet Druzhby Narodov, Moscow (USSR).
For primary bibliographic entry see Field 08B.
W73-04769

RIVER-BED DEGRADATION DOWNSTREAM OF DAMS,
State Hydraulic Works, Ankara (Turkey).
For primary bibliographic entry see Field 08B.
W73-04770

EFFECT OF FLOW VARIATION DOWNSTREAM OF A POWER PLANT ON THE BEDLOAD DISCHARGE OF ALLUVIAL RIVERS,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 08B.
W73-04771

SOIL-MOISTURE EFFECTS OF CONVERSION OF SAGEBRUSH COVER TO BUNCHGRASS COVER,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02D.
W73-04786

FACTORS AFFECTING FLOODS FROM WATERSHEDS IN HUMID REGIONS OF NORTHEASTERN OHIO,
Akron Univ., Ohio. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-04790

A METHODOLOGY FOR ESTIMATING RESERVOIR OPERATION EFFICIENCY BENEFITS FROM SNOWMELT FORECASTING IMPROVEMENTS,
Michigan Univ., Ann Arbor.
R. W. Fenton.
Ph D Thesis, 1972. 189 p, 20 fig, 20 tab, 15 ref, 3 append. OWRR C-1140 (No 1588) (2).

Descriptors: *Runoff forecasting, *Streamflow forecasting, *Snowmelt, *Reservoir operation, Irrigation water, Flood control, Water management (Applied), River forecasting, Mathematical models, Reservoir releases, Water yield, Reservoir yield, Computer programs.
Identifiers: *Snowmelt forecasting, *Snake River basin.

The relationship between errors in streamflow and water supply forecasts and any resulting inefficient reservoir operation was determined by examining the types of forecast errors which may arise, the physical conditions necessary for the forecast error to result in an improper operation decision, and the physical conditions required for an economic loss to occur. To estimate the benefit of avoiding these inefficiencies through improvements in streamflow forecasting, a computer simulation model was developed. The model allocates joint-use storage space in the reservoir on the basis of a Flood Control Reservation Diagram and daily forecasts of remaining season runoff and daily streamflow over the next 30-day period. To prevent widly fluctuating release patterns, which are unacceptable on a real river, feedback and smoothing functions are included in the operations package. The operations model is based on the Palisades-Jackson Reservoir complex on the Snake River in Idaho and Wyoming. Significant benefits may be derived from improved seasonal water supply forecasts if the economic values in the water service area are significant. Major benefits of forecasting improvements are likely to arise in situations where the operating procedures of existing reservoirs are revised by reducing flood storage requirements together with reductions in likely forecast errors. These revisions would be equally beneficial for the design of reservoirs. (Knapp-USGS)
W73-04803

ESTIMATION OF MAXIMUM RUNOFF VOLUMES FOR SMALL PIEDMONT WATERSHEDS,
Clemson Univ., S.C.
D. Suarez.
M Sc Thesis, December 1971. 95 p, 29 fig, 24 tab, 36 ref. OWRR B-008-SC (3).

Descriptors: *Runoff forecasting, *Rainfall-runoff relationships, *Mathematical models, Mass curves, Small watersheds, Time of concentration, Depth-area-duration analysis, Hydrograph analysis.

A mathematical model for estimating maximum volumes of runoff published by the U.S. Soil Conservation Service was analyzed to determine its applicability to small Piedmont watersheds. The observed volumes of runoff resulting from 20 storm events for 6 small experimental watersheds of the Piedmont region were compared with volume of runoff estimates obtained by using the SCS method and a modification of the SCS method. The estimates of maximum volumes of runoff using the SCS method and the modified SCS method closely approximate actual values for the Clemson Research Watershed, using only three storm events. The estimates for the Virginia watersheds were much higher than the observed maximum volumes of runoff. A modification in the selection of minimum permissible rates of quick return flow as functions of observed 21-day antecedent precipitation resulted in an improvement of estimates of maximum runoff for the Piedmont watersheds. The 21-dayantecedent precipitation and 30-day antecedent potential evapotranspiration in combination with the 10-day design rainfall have a linear relationship with the ratio of observed runoff to estimated runoff. The results obtained apply only to watersheds with a time of concentration of about 1.5 hours. (See also W73-04805) (Knapp-USGS)
W73-04804

ESTIMATION OF MAXIMUM RUNOFF VOLUMES FOR SMALL PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Water Resources Research Inst.
D. Suarez, and T. V. Wilson.
South Carolina Water Resources Research Institute Research Report, 1972. 26 p, 8 fig, 3 tab, 11 ref. OWRR B-008-SC (4).

Descriptors: *Runoff forecasting, *Rainfall-runoff relationships, *Mathematical models, Mass curves, Small watersheds, Time of concentration, Depth-area-duration analysis, Hydrograph analysis.

A mathematical model for estimating maximum volumes of runoff published by the U.S. Soil Conservation Service was analyzed to determine its applicability to small Piedmont watersheds. The observed volumes of runoff resulting from 20 storm events for 6 small experimental watersheds of the Piedmont region were compared with volume of runoff estimates obtained by using the SCS method and a modification of the SCS method. The estimates of maximum volumes of runoff using the SCS method and the modified SCS method closely approximate actual values for the Clemson Research Watershed, using only three storm events. The estimates for the Virginia watersheds were much higher than the observed maximum volumes of runoff. A modification in the selection of minimum permissible rates of quick return flow as functions of observed 21-day antecedent precipitation resulted in an improvement of estimates of maximum runoff for the Piedmont watersheds. The 21-day antecedent precipitation and 30-day antecedent potential evapotranspiration in combination with the 10-day design rainfall have a linear relationship with the ratio of observed runoff to estimated runoff. The results obtained apply only to watersheds with a time of concentration of about 1.5 hours. (See also W73-04804) (Knapp-USGS)
W73-04805

POSSIBLE CHANGES IN INFLOW OF SURFACE WATERS TO THE SEA OF AZOV (PRITOK POVERKHNOSTNYKH VOD V AZOVSKOYE MORE I YEGO VOZMOZHNYYE IZMENENIYA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-04811

DEVELOPMENT OF A MATHEMATICAL MODEL TO PREDICT THE ROLE OF SURFACE RUNOFF AND GROUNDWATER FLOW IN OVERFERTILIZATION OF SURFACE WATERS,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 05B.
W73-04839

NEED FOR ENVELOPE MATERIAL ABOVE DRAINTILE,
Agricultural Research Service, Sidney, Mont.
R. W. Saulmon.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR4, p 661-663, 1971. 1 fig, 3 ref, append.

Descriptors: Drainage, Tiles, Filtration, Filters, Drainage practices, *Tile drainage, Tile drains, Flow, Drainage engineering.
Identifiers: Envelope material.

The fitter or envelope material often placed around draintile lines can serve any or all of three purposes: (1) To provide proper bedding of the tile sections; (2) to act as a filter to prevent the movement of fine sand and silt into the drain; and (3) to provide a medium of increased permeability next to the tile line to increase the rate of flow into the drain. The effect of removal of half of the envelope on the performance of a draintile installation will vary with each drainage situation. This analysis is limited to a drainage situation in which the tile line flows less than half full and the upper portion of envelope remains unsaturated. During a laboratory study, a comparison was obtained of the performance of draintile installed with a complete envelope to that of one installed with only half of the envelope. The results of this test indicated that elimination of the upper portion of a draintile envelope, which is commonly unsaturated, can cause a decrease in flow rate to the tile. (Skogerboe-Colorado)
W73-04906

IRRIGATORS SHAPE THEIR LAND FOR WATER CONTROL,
Soil Conservation Service, Harlingen, Tex.
For primary bibliographic entry see Field 03F.
W73-04907

MODEL FOR FARM IRRIGATION IN HUMID AREAS,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 03F.
W73-04913

SUBSURFACE IRRIGATION SYSTEM ANALYSIS AND DESIGN,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W73-04914

WATER STORAGE AND DRAINAGE UNDER A ROW CROP ON A SANDY SOIL,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, W. R. Gardner, and C. B. Tanner.
Agronomy Journal, Vol 62, No 1, p 48-51, 1970. 5 fig, 9 ref.

Descriptors: *Drainage, *Evaporation, Darcy's Law, Root zone, *Evapotranspiration, Soil-water-plant relationships, Soil moisture, Beans.
Identifiers: Soil-water storage, Soil water characteristics.

Drainage from the root zone of snap beans grown on a sandy soil was measured by a lysimeter, and calculated from Darcy's law, and by a hydrologic balance equation. At the end of a 60 day period the Darcy's law calculation gave an 11% higher estimate of the cumulative drainage than the other two methods. Of the 32 cm of precipitation and decrease of 3 cm in water storage from emergence to harvest, evapotranspiration accounted for 17 cm, and drainage for 18 cm. A useful estimate of the drainage from the root zone in sandy soil was obtained from the space averaged capillary conductivity of the soil in which rooting occurred. (Skogerboe-Colorado)
W73-04915

NUMERICAL ANALYSIS OF FREE SURFACE SEEPAGE PROBLEMS,
University Coll. of Swansea (Wales).
P. W. France, C. J. Parekh, J. C. Peters, and C. Taylor.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR1, p 165-179, 1971. 12 fig, 16 ref.

Descriptors: Aquifers, Drainage, Hydrology, *Seepage, Wells, Soil mechanics, *Numerical analysis, Computers, *Finite element analysis.
Identifiers: Time dependence.

The finite element numerical technique is used to effect a solution to linear seepage problems. Particular reference is made to the time dependent movement of a phreatic surface. The flow domain is represented by subdomains composed of isoparametric elements, which permit a close approximation to curved boundaries. The ease of application to seepage through inhomogeneous media is demonstrated during the development of the finite element discretization technique. It is shown that relatively few of the sophisticated isoparametric elements yield solutions to particular flow situations which compare favorably with other numerical and experimental methods for both steady state and time dependent problems. The generality of approach is shown by particular examples, such as flow towards wells and through an earth dam which amplify the versatility of the particular numerical technique used. (Skogerboe-Colorado)
W73-04924

A MODEL OF A GROWING PASTURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Meteorological Physics.
G. W. Paltridge.
Agricultural Meteorology, Vol 7, No 2, p 93-130, 1970. 12 fig, 4 tab, 25 ref, append.

Descriptors: *Model studies, *Growth, *Vegetation, *Pastures, Leaves, *Photosynthesis, *Carbon dioxide, Radiation, Roots.

An attempt is made to model a developing pasture in a manner requiring no experimental data on dependent variables. The term 'pasture' includes all forms of uniform vegetation which can be characterized primarily by leaves and roots. The model is based on the concept of limiting values. At any time at a particular level in the canopy, growth is determined by one of three parameters (radiation available, carbon dioxide available, or the capacity of individual leaves to carry out the photosynthetic conversion) which are calculable from the defined above-crop external conditions and the parameters of the plant which have been selected as independent. Because the model does not rely on field data, it is possible to use simple evolutionary constraints to enable the pasture to generate its own architecture as the photosynthesized material becomes available. Soil water status is included, so that the effect of water deficit on the growth pattern of both leaves and roots can be investigated. The most obviously useful agrometeorological concepts have been incorporated, so that for a particular simulation attempt it is only necessary to devise suitable physical descriptions of leaf shape and orientation. Illustrative trials of the model compare well (in those aspects where comparison is possible without direct simulation) with real pastures, and reveal behavior-patterns which may help to direct experimental research in the field. (Skogerboe-Colorado)
W73-04933

THE EFFECT OF INTAKE EQUATIONS ON THE DEVELOPMENT OF THE WATER ADVANCE EQUATIONS FOR SURFACE IRRIGATION,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
Y. S. Fok, A. A. Bishop, and C. C. Shih.
Transactions of the ASAE, (American Society of Agricultural Engineers), Vol 14, No 5, p 801-805, May 1971. 2 fig, 1 tab, 9 ref.

Descriptors: *Irrigation practices, *Surface irrigation, *Infiltration, Border irrigation.
Identifiers: *Advance rate.

The functional effects of the intake equations on the water advance equations for surface irrigation have been examined by a comparison of the computed results of experimental data from five border irrigation trials conducted at Logan, Utah. Although the variation of intake rate at different locations in the trial borders are within a fairly narrow range, it may offset the small functional difference between the two intake rate equations which were used to develop the water advance equations for surface irrigation. Additional experiments should be conducted on soils having definite functional intake rate characteristics. The ability of both water advance equations to yield good computational results are presented. (Skogerboe-Colorado State)
W73-04964

A MODEL STUDY OF DRAIN ENVELOPES IN A COARSE-SILT BASE MATERIAL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
W. D. Lembke, and D. A. Bucks.
Transactions of the ASAE, (American Society of Agricultural Engineers), Vol 13, No 15, p 669-675, May 1970. 7 fig, 2 tab, 8 ref.

Descriptors: *Drainage engineering, *Subsurface drainage, *Tile drainage, Drainage systems, Drainage, Filters.
Identifiers: *Gravel envelopes.

The resistance-network analogue study of a ponded-surface box model of a tile-drain envelope and surrounding soil showed that the model would need to be extremely large in order to develop a stream pattern in the vicinity of the envelope similar to that which would occur in a field situation. The flow system around the drain was modeled by using source tubes to impose an equipotential surface. The model was observed in testing two thicknesses of envelope material. The top corners of the gravel envelope were found to be particularly subject to intrusion by fine particles. (Skogerboe-Colorado State)
W73-04969

AUTOMATIC FURROW IRRIGATION SYSTEMS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 03F.
W73-04971

SQUARE-MATIC LATERALLY...NEW CONCEPT IN SPRINKLER IRRIGATION ACHIEVES GOALS LONG SOUGHT BY FARMERS.
For primary bibliographic entry see Field 03F.
W73-04985

EVAPOTRANSPIRATION AND DRAINAGE FROM THE ROOT ZONE OF IRRIGATED COASTAL BERMUDAGRASS (CYNODON DACTYLON L. PERS.), ON COASTAL PLAINS SOILS,
Agricultural Research Service, Thorsby, Ala. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W73-04987

LAND GRADING FOR IMPROVED SURFACE DRAINAGE,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
J. I. Sewell.
Transaction of the ASAE (American Society of Agricultural Engineers), Vol 13, No 6, p 817-819, June 1970. 2 fig, 4 tab, 4 ref.

Descriptors: *Land management, *Land forming, *Surface drainage, Furrow drainage, *Tennessee.
Identifiers: *Land grading.

In 1962 a 123.4 acre plot of bottomland on the West Tennessee Experiment Station was graded. Rather extensive cutting and filling showed no significant adverse effects on corn silage yield during the first 3 years after land grading. However, these are deep alluvial soils with little profile development. The land could not have been improved sufficiently for mechanized operations without taking similar measures. Graded lands must be tilled in such a manner that back furrows or ridges are not created. (Skogerboe-Colorado State)
W73-04992

THE INFERENCE OF INTAKE AND HYDRAULIC ROUGHNESS PARAMETERS FROM PLOT RUNOFF USING KINEMATIC WAVE THEORY,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 02E.
W73-04994

COMPUTER SIMULATION OF TILE SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
N. A. Bird, and J. A. Mc Corquodale.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 1, p 175-178, January 1971. 7 fig, 8 ref.

Descriptors: *Soil physics, *Irrigation engineering, *Tile drainage, Soil moisture, Sprinkler irrigation, Computer models, Mathematical models, Drainage, Model studies, *Simulation analysis.

The object was to develop a mathematical water balance model that would predict the performance of a tile system by predicting the tile runoff hydrographs. The model included an existing available soil moisture model and an empirical model. The accurate performance of the model was limited by the accuracy of the soil moisture model. An improved available moisture model would permit the prediction of water table heights and tile runoff rates. The feasibility of sprinkler irrigation could also be studied using the model. (Skogerboe-Colorado State)
W73-05005

ELECTRIC CONTROLS FOR AUTOMATIC SURFACE IRRIGATION SYSTEMS WITH REUSE SYSTEM,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 03F.
W73-05007

PLANNING THE UTILIZATION OF A LARGE RESERVOIR IN A POWER SYSTEM,
British Columbia Hydro and Power Authority, Vancouver. Planning Dept.
C. B. Guelke, and A. Kadak.
Engineering Journal, Vol 55, No 5, p 30-33, May, 1972. 9 fig, 2 ref.

Descriptors: *Hydroelectric plants, *Reservoir operation, *Reservoir storage, *Storage capacity, Computers, Streamflow, Tailwater, Drawdown, Mathematical models, Systems analysis.
Identifiers: *Firm energy, *Williston Lake, W.A.C. Bennett Dam, *British Columbia, Efficiency, Operating rule curves, Turbine flow.

In relation to the size of the British Columbia Hydro and Power Authority Integrated System, Williston Lake reservoir has a large energy storage capability. To determine the most effective utilization of this large reservoir in a predominantly hydro-electric power system, a procedure has been developed which utilizes a system computer model. The procedure is illustrated and the system computer studies results are described. The object

was to determine the maximum amount of firm energy that would be available from the System's hydro-electric plants. For each hydro-electric plant, the model calculates the storage at the end of the month by adding the inflow for the month and by subtracting the target turbine flow set for the month. The end of the month reservoir elevation is calculated and tested against the upper and lower rule curves. Peaking capability for each plant is calculated as a function of reservoir elevation, subject to generator limitations. The plants are grouped into subsystems and the plant with the largest energy store is assigned the function of shaping the subsystem output to load requirements. It is shown that a large reservoir in a predominantly hydro-electric power system is a great asset. (Bell-Cornell)
W73-05057

VIRGIN PEATLAND FORESTS IN FINLAND,
Helsinki Univ. (Finland). Dept. of Marshland Forestry.
L. Heikurainen.
Acta Agral Fenn. 123, p 11-26, 1971, Illus, Map.
Identifiers: *Finland, *Forests, Nutrients, *Peatland, Pine-G, Species, Spruce-G, Tree, Vegetation.

Tree species composition, diameter distribution, volume and increment of natural tree stands of common peatland site types are discussed. Information on the relationships between stand volume aad increment is given. Other aims were to find out what types of cuttings are required in connection with drainage, and to establish the volume of the removal from these cuttings. Different peatland forests of the southern and northern parts of Finland are compared. Neither the stand volume nor the increment of climax forests growing on peat showed any clear correlation with the site. There were differences both in volume and in increment between different peatland sites, but the variation obtained within individual site types proved to be quite large. Only between the main groups-spruce swamps and pine swamps-could a clear difference be established. It seems that the volume and increment of tree stands growing on natural peatlands is determined primarily by the water relations; the nutrient contents of the soil seems to be of minor importance. The differences in site quality are brought about clearly only in the tree species composition. Statistical significance was established, for the differences between the southern and the northern parts of the country. In forests having the same volume, increment was better in the southern than in the northern parts of Finland. The interrelationships between increment and volume proved linear. In this respect, the climax forests growing on peat consequently proved to differ from upland forests, in which the corresponding correlation always takes the shape of a curve. This very fact indicates that peatland forests are climax forests.--Copyright 1972, Biological Abstracts, Inc.
W73-05073

TREES, WATER AND PERSPECTIVE,
U. W. Nanni.
S Afr For J. 75, p 9-17, 1970, Illus.
Identifiers: *Land use, Management, *Natal, Trees, Water utilization.

Effects of forests on water supplies in the Natal uplands are deduced. In the greater part of the forestry zone there is only a small range within which afforestation can affect runoff. Popular misconceptions about the effects of forests are dispelled. The effect of tree-planting on regional water supplies is discussed. Afforestation can cause a marked decrease in local runoff. For the scale of future afforestation now considered likely, this effect, seen in relation to the growth of demand for water, is, however, so small that changes in dryland land management to increase runoff are not justified. Funds and energy would be better expended in securing additional water supplies from other sources.--Copyright 1972, Biological Abstracts, Inc.
W73-05074

THE NITROGEN GAIN OF FOREST ECOSYSTEMS FROM PRECIPITATION (IN GERMAN),
Standortslehre Forstlichen Forschungsanstalt, (West Germany). Institut fuer Bodenkunde.
R. Hueser.
Z Pflanzenernahr Bodenko, Vol 129, No 1, p 42-50, 1971, Illus, Map, English summary.
Identifiers: Ecosystems, *Forests, *Nitrogen, Precipitation.

Forest ecosystems act as a filter and retain nearly all the N coming from precipitation. Rainwater was collected at 2 sites near Grafrath, and the total N was measured, including forms other than ammonium-N and nitrate-N. Not all the precipitation as rain, snow and fog could be collected quantitatively with the same degree of accuracy. The mean total values for the 2 sites were 13.5 and 15.0 kg/ha/yr with 7.9 and 8.4 kg inorganic (NH4 (+) + NO2 (-) + NO3 (-)), respectively. These amounts probably were minimum values. There were additionally 2.4 and 4.3 kg N in the atmospheric dust.--Copyright 1972, Biological Abstracts, Inc.
W73-05080

ON THE KNOWLEDGE OF THE FOREST VEGETATION OF THE LOWER PART OF THE CALINESTI CREEK (VILCEA AREA, ROMANIA),
Babes-Bolyai Univ., Cluj (Rumania).
M. Ciurchea, and E. Chirca.
Rev Roum Biol Ser Bot, Vol 16, No 4, p 243-258, 1971.
Identifiers: Calinesti Creek, Carpinus-D, Fagus-D, *Forests, Quercus-D, *Romania, *Vegetation.

Three forest associations were found along the Calinesti creek at altitudes between 600 and 1000/m. These are the Querco petraea-Carpinetum praemoescium nova ass. reg., Carpino-Fagetum Pauca praemoesicum Vida oltenicum nov. ras. loc. and Deschampsio flexuosae-Fagetum Soo praemoesicum nova var. reg. These are classified in the alliance Fagion dacicum Soo. The first two belong to the suballiance Carpinion dacicum Soo and the last belongs to the suballiance Deschampsio-Fagion Soo. The associations are described and tables on their composition are presented.--Copyright 1972, Biological Abstracts, Inc.
W73-05083

HYDROLOGY AND RECREATION ON THE COLD-WATER RIVERS OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 05G.
W73-05094

SNOWDRIFT CONTROL TECHNIQUES AND PROCEDURES FOR POLAR FACILITIES,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 02C.
W73-05100

CORRELATIONS BETWEEN GRASSLAND VEGETATION AND SITE WITH SPECIAL REGARD TO THE WATER BALANCE, (IN GERMAN),
For primary bibliographic entry see Field 02G.
W73-05125

SIGNIFICANCE OF COMPETITION BETWEEN THE TREE STAND AND YOUND GROWTH IN REGENERATION OF BILBERRY-PINE FORESTS, (IN RUSSIAN),
V. V. Tatarinov.
Ekologiya. Vol 2, No 3, p 31-40. 1971. Illus.
Identifiers: *Bilberry-D, Forests, Growth, Light, Minerals, Moisture, *Pine-G, Regeneration, *Spruce-G, Trees.

The effects of competition of mature trees for light, moisture, and mineral nutrition on the density and growth of pine and spruce generations in a bilberry-pine forest are discussed. Pine is unable to regenerate under these conditions owing to the interception of radiant energy by the crowns of mature trees and young spruce growth. Growth of the young spruce generations is inhibited mainly during competition with the root systems of the maternal trees for moisture and available forms of N.--Copyright 1972, Biological Abstracts, Inc.
W73-05142

AGE COMPOSITION AND REGENERATION OF COENOPOPULATIONS OF THE SIBERIAN PINE IN THE SWAMP FORESTS OF THE TRANSURALIAN CENTRAL TAIGA, (IN RUSSIAN),
V. A. Kirsanov.
Ekologiya. Vol 1, No 6, p 46-51, 1970.
Identifiers: *Age composition, Coeno, Damage, Forests, Lessened, Pine-G, Pinus-Siberica-G, Populations, *Regeneration, Rodents, Seeds, *Siberian pine, Swamp, Taiga, Transuralian, USSR.

Data are given on the uneven-aged composition and good regeneration of coenopopulations of the Siberian pine (Pinus sibirica) in the swamp forests of the Transuralian central taiga. This phenomenon is related with the better protection of the pine disseminules in swamps against extermination by rodents.--Copyright 1972, Biological Abstracts, Inc.
W73-05155

BIOLOGICAL PRODUCTIVITY OF SOME MEADOW COMMUNITIES OF THE LITHUANIAN SSR, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
N. A. Lapinskene, and Y. Y. Strazidaite.
Tr Akad Nauk Litov SSR Ser V. 3, p 3-13, 1970, English summary.
Identifiers: Aboveground, *Biological communities, Jura River, *Lithuanian-SSR, Meadows, *Productivity, USSR.

Local ecological conditions and biological properties of the plant species greatly influenced the biological productivity of these communities. The total phytome quantity of the water-meadow communities fluctuates from 206-324 quintals/ha and that of the phytocenoses of the slopes exposed to erosion, from 278-512 quintals/ha. Between 64-90% of the total biomass of the investigated meadow communities is made up of their subterranean part in which small roots (<1 mm in diameter) prevail. The yield of the above/ground part of the investigated phytocenoses fluctuates from 35-83 (in the water-meadows of the river Jura) and from 29 till 116 quintals/ha (on the slopes exposed to erosion). Dead plant cover makes up significant part (12-25 quintals/ha) of the above-ground yield. The ratio between subterranean and overground parts fluctuates from 1:2-1:6 (in the water-meadows) and 1:2-1:10 (in the meadows exposed to erosion).--Copyright 1972, Biological Abstracts, Inc.
W73-05156

BIOECOLOGICAL STUDIES IN THE SANDY DESERTS TO THE SOUTH OF THE LAKE BALKHASH, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Botaniki.

L. Y. Kurochkina, G. A. Baigozova, S. E. Esenova, and T. Bolatbaev.
Bot Zh. Vol 56, No 2, p 202-214, 1971, Illus, Map, English summary.
Identifiers: *Lake Balkhash, *Deserts, Ecological, *Floristics, Lakes, Pastures, Phenology, Regime, USSR.

The uniqueness of the northern deserts was confirmed by long-term studies of the vegetation of Tau-Kumy Desert (Kazakhstan). This conclusion is based on the composition of the flora, predominating and endermic species and communities, on the rhythms of development and on the environmental conditions, including the water regime of soils and plants. Autumn and spring grazing in addition to the utilization of sandy pastures in winter practiced at present was suggested.--Copyright 1972, Biological Abstracts, Inc.
W73-05162

STUDY OF EUGLENOPHYTA OF THE RIGHT BANK GRASS STEPPE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
Z. I. Asaul, and S. A. Bleikh.
Ukr Bot Zh. Vol 27, No 6, p 781-783. 1970. English summary.
Identifiers: Euglena, *Euglenophyta, Grass-M, Petalomonas-Mediocanullata-Var-Disom, Phacus, Records, Steppe, Ukraine, USSR.

Investigations were made of 5 rivers (Danube, Sarata, Kogilnik, Nerushay, Karasulak), 7 lakes (Sasyk, Kitay, Katiabukh, Safyan, Yalpukh, Kartal, Kagul) and 7 ephemeral ponds of the Right Bank Grass Steppe. Of the 48 spp. found, most belonged to the genera Euglena (16) and Phacus (11). Petalomonas mediocanullata Stein var. disomata (Stokes) Lemm. is new for the Ukraine. Floristic composition, general and specific species of Euglenophyta in different types of water in the region of the Ukraine are given.--Copyright 1972, Biological Abstracts, Inc.
W73-05190

4B. Groundwater Management

GROUNDWATER RECHARGE AS AFFECTED BY SURFACE VEGETATION AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
A. Klute, R. E. Danielson, D. R. Linden, and P. Hamaker.
Available from National Technical Information Service as PB-214 579, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Ft. Collins, Completion Report Series No 41, December 1972. 48 p, 5 fig, 8 tab, 7 ref. OWRR B-013-COLO (2), 14-01-0001-1434.

Descriptors: Evaporation, Mulching, *Soil water movement, Vegetation, Control, *Groundwater recharge, *Soil treatment, Vegetation effect, Irrigation effects, *Water table, Surface-groundwater relationships, *Colorado, *Soil profiles.

Groundwater resources on the high plains of Colorado are being mined for irrigation at a rate surpassing natural recharge of the aquifer. Detailed information on recharge rates, as well as possible methods for increasing recharge, is essential to sound agricultural planning. Various surface soil treatments were investigated in field experiments to determine their effect on groundwater recharge. Plots were established in 1967 on initially very dry soil of semi-arid native range land. The water table is about 100 feet below the surface. Water content profiles were measured periodically to determine the downward movement of water resulting from the surface treatments. Changes in the total water content of the profile were used to evaluate soil water accumulation and possible groundwater recharge. A 2.5 cm coarse sand and gravel mulch, with vegetation controlled by herbicides, accumulated 50% of the annual precipitation during a two-year period. The sand and gravel mulch with native grass vegetation showed only seasonal fluctuations in the upper 120 cm of the profile with no net accumulation of water. Fallow treatments (chemical and mechanical) did not show significant accumulation until heavy October 1969 snows. Matric potential profiles for various locations on fine textured soils in the high plains area showed high tension values to considerable depths except where conservation practices or irrigation had been used.
W73-04555

PRELIMINARY INVESTIGATION OF A GROUNDWATER MANAGEMENT PROGRAM FOR THE BIG SIOUX RIVER,
South Dakota State Univ., Brookings. Water Resources Inst.
D. D. Brosz, and J. L. Wiersma.
Available from National Technical Information Service as PB-214 482, $3.00 in paper copy, $0.95 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, December 27, 1972. 42 p, 28 fig, 14 ref. OWRR-A-027-SDAK (1), 14-01-0001-3242.

Descriptors: Groundwater, *Groundwater movement, Groundwater recharge, Water table, *Water management, Aquifer, Water storage, *Surface-groundwater relationships, *Overflow, *Dams, Irrigation water, *South Dakota.
Identifiers: *Big Sioux River.

The general objective was to adequately define the problems and to offer possible solutions associated with developing a plan for groundwater management for the Upper Big Sioux River. An attempt was made to determine what information is necessary for developing a complete plan for groundwater management and to determine what the potential benefit or damage might be from raising the groundwater table along the river banks. The basic idea of the management program for the river envisions a series of overflow dams on the main channel. These dams would be capable of raising the water level within the channel and the accompanying raise in river stage would result in movement of surface water to the adjacent outwash aquifer.
W73-04563

WATER MINING TO MAKE THE DESERTS BLOOM,
N. Valery.
New Scientist, Vol 56, No 819, p 322-324, Nov. 9, 1972. 3 fig.

Descriptors: *Groundwater mining, *Overdraft, *Agriculture, *Land reclaimation, *Arid lands, Salinity, Soil-water-plant relationships, Water conservation, Crop production, Water utilization, Efficiencies, Water resources development, Water management (Applied), Laboratories, Precipitation (Atmospheric), Hydrologic data, Risks, Groundwater recharge, Age, Saline water, Irrigation water, Drainage, Recycling, Sewage effluent, Sewage disposal, Desalination, Sea water, Water table, Springs, Sewage treatment, Dunes, Clays, Adsorption.
Identifiers: Israel, Negev Desert, Overgrazing, Dust bowls, Oasis.

Arid lands may desiccate because of over grazing by camels and goats, leading to dust bowls to be reclaimed by massive efforts of irrigation to use the land for agricultural development with resulting increases in salinity. The relationship between soil, water and plants is investigated with a view to water conservation, crop production and efficient use of resources. Israel is a near-perfect laboratory with annual average precipitation varying from one to 40 inches. Uncertainty of data and statistics of hydrologic phenomenon are most pronounced in the desert. Groundwaters play the dominant part in Israel's industrial and agricultural development. Recharge and age of groundwater are discussed. Groundwater in the Negev may be as old as 20,000 years, where no recharge potential now exists. These fossil and highly mineralized waters may be used for irrigation if adequate drainage is provided. Recycling sewage water, use of desalinated seawater and adjustment of water table to prevent spring seepage to the sea are possible water conservation strategies. Sewage treatment techniques and desalination methods are outlined. Irrigation is possible with saline waters where soils are free of absorbing clays, as in sand dunes. Figures show the extent of sand dune lands, a typical sweet water oasis (spring), and effects of recharging by rainwater and spreading of sewage water. (Popkin-Arizona)
W73-04584

PROCEEDINGS OF THE NATIONAL GROUND WATER QUALITY SYMPOSIUM.
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W73-04635

PERFORMANCE OF WELL-GROUPS AT CONSTANT DRAWDOWN,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
G. Karadi.
Water Resources Bulletin, Vol 8, No 6, p 1277-1279, December 1972.

Descriptors: *Drawdown, *Water yield, Hydrogeology, Mathematical studies, Water level fluctuations, Well spacing, Dewatering.
Identifiers: *Principle of superposition, *Well interference.

The performance of well groups can be analyzed by using the principle of superposition if the boundary conditions are specified in terms of the flow rate. This principle states that, at a given point in the zone of influence of the drawdown, the total drawdown caused by pumping the wells is equal to the sum of drawdowns caused by each individual well. Certain problems, such as interference of flowing artesian wells, groundwater control by vacuum well points, and others, cannot be treated by the traditional application of the method of superposition. The key to the solution is to find a solution for a single well with variable head condition. There are two ways to overcome serious mathematical difficulties: (a) the variable head boundary condition is expressed in terms of power series and the constant of the first, second, etc., order terms are obtained to satisfy the conditions for specified times; (b) higher accuracy is available if the solution is obtained for short time intervals only, assuming that the drawdown is a linear (or quadratic) function of time. (Knapp-USGS)
W73-04785

GROUND-SURFACE WATER INTERACTION IN THE LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Thermal and Fluid Sciences Center.
For primary bibliographic entry see Field 02F.
W73-04788

THE CONCEPT OF SAFE GROUNDWATER YIELD IN COASTAL AQUIFERS,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-04793

FIELD MEASUREMENT OF HYDRAULIC CONDUCTIVITY ABOVE A WATER TABLE WITH AIR-ENTRY PERMEAMETER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W73-05006

APPRAISAL OF WATER RESOURCES IN THE EAST CENTRAL FLORIDA REGION,
Geological Survey, Richmond, Va.
W. F. Lichtler.
Florida Bureau of Geology Report of Investigations No 61, 1972. 52 p, 11 fig, 7 tab, 7 ref.

Descriptors: *Water resources development, *Groundwater resources, *Surface waters, *Water quality, *Florida, Rainfall-runoff relationships, Aquifer characteristics, Water level fluctuations, Water yield, Pumping, Water wells, Water utilization, Groundwater recharge, Planning, Projections, Hydrologic data, Chemical analysis.

The East Central Florida Region includes seven counties with a total area of 7,051 square miles. The continuing rapid development of the Region has resulted in an increasing demand upon its water resources. The groundwater system that underlies the entire Region--the Floridan aquifer and the overlying unconfined aquifer--is by far its largest and most efficient water reservoir. Surface reservoirs are mostly shallow and subject to high evaporation losses and contamination and are fed by streams that have very low flow during droughts. The total recharge to the Floridan aquifer, under natural conditions, is estimated to be about 1,000 mgd. Projections for the year 1990 indicate that groundwater usage may total about 60% of the natural recharge rate. This appraisal indicated that sound water-management practices will be necessary to maintain the projected 1990 usage without aquifer depletion and damage. Possible land-use controls include zoning, tax rebates, subsidies, and public ownership of the best recharge areas. Artificial recharge techniques include construction of connector wells that connect the nonartesian aquifer to the Floridan aquifer, augmentation of recharge by importing water from surface runoff areas, use of recharge wells for accepting treated storm water, and land spreading of treated sewage effluent. (Woodard-USGS)
W73-05091

GROUND WATER IN THE HALLANDALE AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. W. Bearden.
Florida Bureau of Geology Information Circular No 77, 1972. 32 p, 13 fig, 5 tab, 19 ref.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Water quality, *Florida, Water resources development, Hydrologic data, Pumping, Water yield, Groundwater recharge, Water utilization, Transmissivity, Water level fluctuations, Saline water intrusion, Chemical analysis, Rainfall, Hydrogeology.
Identifiers: *Hallandale area (Fla).

Fresh groundwater for all purposes in Hallandale is provided by the highly permeable Biscayne aquifer. The aquifer is composed chiefly of permeable limestone, sandstone, and sand that extends from land surface to a depth of approximately 200 feet. The major source of recharge to the aquifer is rain that falls on the area and infiltrates to the water table. The aquifer is also recharged by Snake Creek Canal during dry periods. The configuration of the water table in Hallandale is greatly influenced by the Intracoastal Waterway, the Oleta River, Snake Creek Canal, and municipal pumping. Large quantities of water are available from the Biscayne aquifer in Hallandale. The aquifer is similar in character to the aquifer in the vicinity of the well fields in the city of North Miami Beach, where transmissivity ranges from 2.0 to 2.5 mgd/foot. The chemical quality of the groundwater is generally good except in areas of sea-water intrusion. The inland extent of this intrusion at the base of the aquifer has been detected 0.3 mile east of the well field. The well field is 2 miles west of the Intracoastal Waterway, the closest source of sea-water intrusion. Developing new, additional supplies in the southwest part of Hallandale would safeguard the aquifer against salt-water intrusion. (Woodard-USGS)
W73-05092

WATER QUALITY AND PHYSICAL CHARACTERISTICS OF NEVADA TEST SITE WATER-SUPPLY WELLS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-05093

THE GROUNDWATER ENVIRONMENT.
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 02F.
W73-05101

AN INVESTIGATION OF FILTER MEDIA FOR RECHARGE WELLS IN THE GRAND PRAIRIE REGION OF ARKANSAS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
C. S. Smith.
M Sc Thesis, 1972. 54 p, 11 fig, 11 tab, 22 ref, append. OWRR A-010-ARK (3).

Descriptors: *Groundwater recharge, *Artificial recharge, *Recharge wells, *Well filters, *Arkansas, Sands, Gravels, Testing, Turbidity, Aquifers, Gravity, Colloids, Water quality, Costs, Date collections, Analytical techniques, Water treatment, Flow rates, Evaluation, Irrigation, Rice, Water storage.
Identifiers: *Grand Prairie Region (Ark).

Field tests were used to determine whether gravity flow recharge wells filled with sand and gravel can be used in the Grand Prairie of Arkansas. The wells are of a new type, filled with a sand and gravel filter. A suitable filter media will allow water to be recharged without any other treatment. Plugging should occur at the top of the well instead of in the aquifer, so that the well can be reconditioned simply by replacing or cleaning the filer. The experimental study was divided into the water supply system, the flow measuring system, and the filter. The filter media was made up of sand and gravel provided by a local supply company. Different depths of sand and gravel were used in the tests as well as different sizes of sand. In the preliminary testing, the sand used was graded concrete-mix sand. In the final tests uniformly graded sand (obtained by sieving the concrete mix sand) was used. The resulting particle size ranges were (1) greater than 1.19 mm, (2) 0.59-1.19 mm, (3) 0.25-0.59 mm, and (4) less than 0.25 mm. The sand filters had little effect on the turbidity of the water. A higher degree of treatment will have to be used on the type of water tested before it can be successfully recharged. The concrete mix sand, fine sand, or very fine sand could not be economically used as a filter in a gravity flow type well because of their low percolation rates and fast plugging rates. (Knapp-USGS)
W73-05106

HYDROLOGY OF CHANNEL-FILL DEPOSITS NEAR SALISBURY, MARYLAND AS DETERMINED BY A 30-DAY PUMPING TEST,
Maryland Geological Survey, Annapolis.
F. K. Mack, and W. O. Thomas, Jr.
Available from Maryland Geological Survey, Johns Hopkins Univ., Baltimore, Md. 21218, Price $5.50. Maryland Geological Survey Bulletin 31, Part 1, p 1-60, 1972. 33 fig, 8 tab, 16 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrologic properties, *Pumping, *Maryland, Water wells, Water yield, Transmissivity, Drawdown, Water quality, Water level fluctuations, Groundwater movement, Groundwater recharge, Hydrogeology, Sediments, Streamflow, Hydrologic data, Well data.
Identifiers: *Salisbury (Md).

The hydrologic characteristics of a very permeable sand and gravel aquifer filling a channel of uncertain origin were tested by pumping the aquifer at 4,000 gpm for 30 days. The aquifer is 2 1/2 miles north of the city of Salisbury, Maryland. Sediments filling the ancient river valley are of Pleistocene age and are as much as 220 feet thick at the pumping test site. The sediments are in three distinct layers, grading from fine-grained sediments at the base to coarser grained sediments at its top. Water levels, measured in 18 observation wells, declined throughout the 30-day period of pumping. The pumped well had a drawdown of 24 feet and a specific capacity of 165 gpm per foot of drawdown. The aquifer transmissivity is 400,000 gpd per foot in the immediate vicinity of the pumping well. The water pumped from the aquifer is a sodium bicarbonate type having a dissolved-solids content ranging from 42 to 52 mg/liter. The most significant change noted during the test was a gradual decrease in the iron concentration from 0.46 mg/liter prior to the test to 0.27 mg/ liter at the end. (See also W73-05110) (Woodard-USGS)
W73-05109

EXPLORATION AND MAPPING OF SALISBURY PALEOCHANNEL, WICOMICO COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
J. M. Weigle.
Bulletin Available from Maryland Geological Survey, Johns Hopkins Univ., Baltimore, Md. 21218, Price $5.50. Maryland Geological Survey Bulletin 31, Part 2, p 61-124, 1972. 14 fig, 4 tab, 13 ref.

Descriptors: *Groundwater resources, *Mapping, *Paleohydrology, *Alluvial channels, *Maryland, Groundwater movement, Water yield, Aquifer characteristics, Well data, Exploration, Drillers logs, Groundwater potential, Water wells, Water quality, Chemical analysis, Hydrogeology, Hydrologic data, Sedimentology, Hydrologic properties, Radioactive well logging, Gamma rays.
Identifiers: *Wicomico County (Md), Paleochannel.

The Salisbury paleochannel is a buried valley in Wicomico County, Maryland. It was carved into an erosional plain at the top of the Miocene deposits and was filled and blanketed subsequently by deposits (mostly sand and gravel) of Pleistocene age. The channel deposits are a prolific source of groundwater. Large amounts of water are stored there. More important, the saturated Pleistocene deposits in the channel offer up to twice the drawdown available in the adjacent Pleistocene deposits outside the channel and therefore require fewer wells to yield equal quantities of water. Because of the greater available drawdown the channel and its deposits could drain groundwater from the adjoining Pleistocene materials and the underlying Manokin aquifer. The bottom of the paleochannel is a depression in the Miocene-Pleistocene contact surface. The channel was located by mapping the Miocene-Pleistocene contact topographically along the presumed channel direction (about 20 mi) by power-augering and gamma-logging through hollow drill-stem. Once the contact was identified along the flanks the deep central parts of the channel could be explored with a few test holes drilled by conventional methods. (See also W73-05109) (Woodard-USGS)
W73-05110

GROUNDWATER RELATIONS OF LITTER AND MARSHY MEADOWS IN THE NORTHERN SWISS PLAIN, (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Geobotany.
For primary bibliographic entry see Field 02I.
W73-05151

4C. Effects on Water of Man's Non-Water Activities

WATER RESOURCES IN SOURDOUGH AND HYALITE CREEK WATERSHEDS--A COMPARATIVE STUDY OF QUALITY AND HYDROLOGY,
Montana State Univ., Bozeman. Water Resources Research Center.
R. L. Sanks, and T. T. Williams.
Available from National Technical Information Service as PB-214 664, $3.00 in paper copy, $0.95 in microfiche. Completion Report 23, April 1972. 28 p, 2 fig, 3 tab, 5 ref, append. OWRR A-028-MONT (1).

Descriptors: *Hydrologica aspects, *Watersheds, *Water data, *Water supply, *Water quality, *Montana.

The two watersheds selected for this study are similar in size, elevation, and topography; but entirely different as to land use. From 1917 until 1970 Sourdough Creek watershed was closed to public use because it has been one of the sources of water for the City of Bozeman. Hyalite Creek watershed has always been open and has been widely used for grazing and recreation. There has been some logging on each watershed. This study was designed to satisfy the following objectives: (1) To help provide answers to the question of whether Sourdough Creek watershed should remain closed to human use. (2) To provide information relative to the effectiveness of current logging techniques in preventing subsequent erosion; to pinpoint areas of potential erosion and sedimentation problems; and to evaluate the severity of erosion and sedimentation on the watersheds. (3) To obtain some knowledge of the basic hydrology of the watersheds as an aid to future planning studies on these and on similar watersheds throughout the Pacific-Northwestern United States. Objectives 1 and 3 were satisfied.
W73-04631

FLUVIO-MORPHOLOGIC CONSEQUENCES OF A CONSTRICTION AT THE ENTRANCE TO A RIVER BEND,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W73-04756

4D. Watershed Protection

SOIL-LOSS CONSIDERATIONS IN CHAPARRAL-TO-GRASS CONVERSIONS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
R. S. Boster, and L. R. David.
In: National Symposium on Watersheds in Transition, co-sponsored by American Water Resources Association and Colorado State University, June 1972, Ft. Collins, Colorado. p 243-250, 1972. 2 tab, 4 fig, 24 ref.

Descriptors: *Soil erosion, *Chaparral, *Economics, *Brush control, *Land clearing, Soil stabilization, Planning, Evaluation, Land management, Grazing, Arizona, Southwest U.S., Watersheds, Social aspects, Political aspects, Forest management, Range management, Soil conservation, Arid lands, Watershed management.

Productivity of chaparral watersheds can sometimes be increased as a result of conversion to grass. However, the increased soil losses usually associated with the early phases of conversion programs are a valid concern. By a 'with and without' method and a 'worst possible approach' method, this study sought to determine the societal impacts of conversion-caused soil losses for chaparral watersheds in the Salt-Verde Basin, Arizona. Present knowledge permits chaparral conversions to be designed with minimal initial sediment loss, and with soil savings over time. With proper site selection, professional planning, and an effective post-treatment maintenance program, productivity can increase regardless of any realistically probable soil losses. If an adequate grass stand is established and maintained, vegetative conversions can save soil over time. Further, properly planned conversions would cause negligible to non-existent off-site sediment impacts, and would not appreciably influence reservoir life expectancy. Conclusions should apply for many other chaparral areas. (See also W73-03536) (Black-Arizona)
W73-04602

CRITICAL SOIL MOISUTRE LEVELS FOR FIELD PLANTING FOUR-WING SALTBUSH,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W73-04603

EVALUATION OF PLANNING FOR WETLANDS DRAINAGE PROJECTS IN THE SOUTHEASTERN COASTAL PLAINS,
Research Triangle Regional Planning Commission, Research Triangle Park, N.C.
For primary bibliographic entry see Field 06B.
W73-04624

WATER RESOURCES IN SOURDOUGH AND HYALITE CREEK WATERSHEDS--A COMPARATIVE STUDY OF QUALITY AND HYDROLOGY,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 04C.
W73-04631

SEDIMENT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05B.
W73-04896

IOWA PASSES EROSION-CONTROL LAW,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 06E.
W73-04905

CONSERVATION OF SANDY SOILS WITH A SURFACE MULCH,
Agricultural Research Service, Big Spring, Tex.
D. W. Fryrear, and P. T. Koshi.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 3, p 492-495, March, 1971. 10 fig, 10 ref.

Descriptors: *Soil conservation, *Water conservation, *Erosion control, *Mulching, Cultivation, Soil erosion, Sediment control, Runoff, Dust storms, Evaporation, Irrigation engineering.
Identifiers: *Pollution control.

A mulch surface cover on sandy soils will reduce wind erosion, increase soil moisture storage, improve dry aggregate stability, and increase crop yields. The percent soil surface covered with varying amounts of cotton gin trash, wheat, and sorghum stubble was determined. The percent soil cover was used to develop a mulch coefficient (100 percent soil cover equals a mulch coefficient of 1.0). The mulch coefficient was related to soil moisture storage, crop yield, evaporation, wind erosion loss, and runoff using the results of this study and previous research by other scientists. A mulch coefficient of 0.6 to 0.8 was sufficient to control wind erosion and runoff. Good soil moisture storage, evaporation reduction, and crop yields have been obtained with a mulch coefficient of 1.0. (Skogerboe-Colorado State)
W73-04974

GRADED ROWS FOR THE CONTROL OF RILL EROSION,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
W. S. Harris, and W. S. Watson, Jr.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 3, p 577-581, March 1971. 11 fig, 9 ref.

Descriptors: *Soil conservation, *Rill erosion, *Contour farming, *Erosion control, Soil erosion, Cultivation, Sediment control, Runoff, Flood control, Irrigation engineering.
Identifiers: *Graded rows.

Graded rows were designed, constructed, and farmed with the control of rill erosion as a primary objective. The research was on two separate and distinct land-grading problems. The first on a hill and the second on relatively steep bottom land. Graded rows are defined as bedded crop rows that channel the flow of surface water. The purpose of graded rows is to prevent surface water from concentrating on fields and causing erosion. Graded rows have eliminated rill erosion on hill land and permitted 'controlled' rill erosion and sedimentation on bottom land. (Skogerboe-Colorado State)
W73-04979

PREDICTION OF SEDIMENT YIELDS FROM SMALL WATERSHEDS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
J. R. Williams, E. A. Hiler, and R. W. Baird.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 6, p 1157-1162, June, 1971. 5 fig, 5 tab, 19 ref.

Descriptors: *Erosion, *Sediments, Soil conservation, Surface waters, Pollutants, Mathematical models, *Watersheds, Water pollution sources.

A procedure for predicting sediment yields from small watersheds has been developed. The results should be a better understanding of the factors that cause sediment yield and the development of sediment prediction equations for each physiographic area. Procedures for calculating sediment yields were presented. It is feasible to develop a procedure for predicting sediment yield from small watersheds based on climatic factors, watershed characteristics, and land use and treatment factors. A combination of these variables explained 63 percent of the variation in sediment concentration from small watersheds. Storm characteristics accounted for the largest variation in sediment concentrations. The next largest variation was explained by a land treatment factor. (Skogerboe-Colorado State)
W73-04980

EXPERIMENTAL STUDY OF ANTI-EROSION ROLE OF VEGETATION IN THE MOUNTAIN CRIMEA, (IN RUSSIAN),
Krymskii Gosudarstvennyi Pedagogicheskii Institut, Simferopol (USSR). Dept. of Botany.
F. Y. Popovych, A. M. Oliferov, Serkova, and Y. I. Dmytriyev.
Ukr Bot Zh., Vol 27, No 6, p 716-725. 1970. Illus. English summary.

Identifiers: Crimea, *Erosion control, Forests, Grass M, Mountains, Runoff, USSR, *Vegetation effects.

Anti-erosion was measured by the artificial rainfall method. Runoff and erosion were measured every minute. Erosion on slopes covered with forests, grass vegetation (with the different degrees of cover), and on the uncovered argillaceous schists and sandstone was measured.--Copyright 1972, Biological Abstracts, Inc.
W73-05123

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

NEMATODE COMMUNITY STRUCTURE, A TOOL FOR EVALUATING WATER RESOURCES ENVIRONMENTS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W73-04556

BINDING AND PRECIPITATION OF TRACE ELEMENTS BY HUMIC SUBSTANCES IN NATURAL WATERS,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
For primary bibliographic entry see Field 05B.
W73-04562

PESTICIDES IN THE LOWER ATMOSPHERE OF THE NORTHERN EQUATORIAL ATLANTIC OCEAN,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
D. B. Seba, and J. M. Prospero.
Atmospheric Environment, Vol 5, No 12, p 1043-1050, December 1971. 1 fig, 1 tab, 29 ref. NONR 4008- (02) NSF GA 25916.

Descriptors: *Atlantic Ocean, *Aerosols, *Pesticide drift, *Dusts, *Winds, Rivers, DDT, DDE, Air pollution, Water pollution.
Identifiers: Barbados (West Indies).

Giant particle size trade wind aerosols were continuously collected in the Barbados, West Indies, from November 22 to December 4, 1968. The average concentration during this time of aerosolborne pp'-DDT and pp'-DDE was 212 x 10-15 gm - 3. Airborne dust is believed to be from the arid regions of West Africa while the pesticides are thought to originate from the higher latitudes of Europe or North America. Wind transport and river transport of pesticides to remote marine environments are discussed. (Ensign-PAI)
W73-04617

MIXING MODEL PREDICTION OF FLUORIDE DISTRIBUTION IN CHESAPEAKE BAY,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-04621

AN ELECTROCHEMICAL METHOD FOR THE DETERMINATION OF TRACE AMOUNTS OF PHOSPHATE IN NATURAL WATER,
Illinois Univ., Urbana. Water Resources Center.
J. A. Cox, and G. L. Lundquist.
Available from the National Technical Information Service as PB-214 486, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana-Champaign, Research Report No. 61, November 1972. 55 p, 15 fig, 13 ref. OWRR A-041-ILL (1). 14-31-0001-3013.

Descriptors: *Phosphates, Pollutant identification, Chemical analysis, Water analysis, Analytical techniques, Electrochemistry.
Identifiers: *Trace analysis, Electrochemical reactions.

The objective was to develop a method for the determination of phosphate in natural water which would be an improvement over the presently accepted spectrophotometric technique in terms of detection limit and freedom from interference. Cathodic stripping chronopotentiometry was found to be an analytically sensitive method for phosphate analysis. The technique is based upon the reversible oxidation of a metallic indicator electrode to an insoluble phosphate salt film. When copper is used as the indicator electrode, the detection limit is 10 ppb. Control of the pH at 6.0 and removal of oxygen from the solution eliminates anticipated interferences in natural water samples. The major drawback of the method is that under the electrolysis conditions employed, salt of mixed stoichiometry is deposited which subsequently results in two separate stripping steps. When mercury is the indicator electrode, the system approaches true Nernstian behavior, so a detection limit considerably below 10 ppb is anticipated. However, an observed interference of chloride ion has, to the present, limited application of the electrode to solutions containing phosphate in excess of 50 ppb.
W73-04627

REDOX POTENTIALS BY EQUILIBRATION,
Queen's Univ., Kingston (Ontario). Dept. of Chemistry.
W. G. Breck.
J Mar Res. Vol 30, No 1, p 121-139. 1972. Illus.
Identifiers: *Oxidation-reduction potential, *Water analysis, Equilibration, *Aerated waters.

Defined is a new approach to Eh (oxidation reduction potential) that allows determination of the redox level of aerated natural waters by a principle of equilibration, thus avoiding the disadvantages of using electrodes in association with any particular chemical system, such as Pt/O2. Arguments are presented that support the view that the poise of aerated is controlled by the O2/peroxide couple rather than by the O2/water couple. It is thought that a small but steady activity of hydrogen peroxide has important functions in the environment.--Copyright 1972, Biological Abstracts, Inc.
W73-04641

QUANTITATIVE DETERMINATION OF CADMIUM IN WATER-SOLUBLE COLOR ADDITIVES BY ATOMIC ABSORPTION SPECTROSCOPY,
Food and Drug Administration, Washington, D.C. Div. of Colors and Cosmetics Technology.
L. Moten.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 1145-1149, September 1972. 6 fig, 1 tab, 4 ref.

Descriptors: *Cadmium, *Aqueous solutions, *Pollutant identification, Heavy metals, Methodology, Solubility, Sodium chloride, Sodium sulfate, Dye concentrations.
Identifiers: *Atomic absorption spectrophotometry, *Color additives, Detection limits, Fluorescein, Triphenylmethane, Azo dyes, Absorbance, Chemical interference, Reproducibility.

A quantitative method is presented for the determination of cadmium at low levels (5-20 ppm) in water-soluble color additives by atomic absorption spectroscopy. Absorption measurements were made on aqueous solutions of typical color additives to which known amounts of cadmium had been added. These measurements were made in order to determine (1) the reproducibility of the absorption measurements of cadmium in aqueous solutions of color additives; (2) the effects of variations in pure dye contents on absorption measurements (samples of color additives submitted for certification vary in pure dye content from 85 to 97 percent); (3) the effects of sodium chloride on sodium sulfate on absorption signals during cadmium measurements. The method requires no pretreatment of sample and should be applicable to all water-soluble color additives. (Holoman-Battelle)
W73-04642

IDENTIFICATION OF POLYCHLOROBIPHENYLS BY HIGH RESOLUTION PROTON MAGNETIC RESONANCE,
Swedish Tobacco Co., Stockholm. Research Dept.
K. D. Bartle.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 1101-1103, September 1972. 2 fig, 24 ref.

Descriptors: *Polychlorinated biphenyls, *Pollutant identification, Mass spectrometry, Methodology, Separation techniques.
Identifiers: *Proton magnetic resonance, *2 3 4 2' 4' 5'-hexachlorobiphenyl, *2 5 2' 5'-tetrachlorobiphenyl, Chlorinated hydrocarbons, PMR spectra, Gas liquid chromatography, Mixtures, Electron capture gas chromatography, Mass spectra.

Mass spectrometry allows the number of chlorine atoms per polychlorobiphenyl molecule to be determined but not the positions of substitution. A method of identifying PCB components from high resolution proton magnetic resonance spectra is illustrated by application to 2,5,2',5'-tetrachloro- and 2,3,4,2',4',5'-hexachlorobiphenyls separated by gas chromatography from a commercial PCB mixture. (Holoman-Battelle)
W73-04643

STUDY OF THE SILICIC ACID PROCEDURE OF ARMOUR AND BURKE FOR THE SEPARATION OF POLYCHLORINATED BIPHENYLS FROM DDT AND ITS ANALOGS,
Food and Drug Administration, Los Angeles, Calif.
H. T. Masumoto.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 1092-1100, September 1972. 7 fig, 2 tab, 8 ref.

Descriptors: *Separation techniques, *Polychlorinated biphenyls, *DDT, *Aqueous solutions, Chlorinated hydrocarbon pesticides, DDE, Chemical analysis, Silica, Inorganic compounds, Gas chromatography, Pollutant identification, Methodology.
Identifiers: *Metabolites, *Silicic acid procedure, *Isomers, p p' DDE, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1254, Aroclor 1260, Adsorbents, Chemical interference, Column preparation, Reproducibility.

The silicic acid procedure of Armour and Burke for the separation of polychlorinated biphenyls from DDT and its analogs produces an adequate separation of Aroclor 1260. However, the procedure cannot completely separate p,p'-DDE from Aroclors 1221, 1232, 1242, and 1254. Factors causing variable column properties such as room humidity, silicic acid activation and deactivation, and column preparation were examined. The 7 hr minimum period for silicic acid activation was found to be inadequate for reproducible water-silicic acid preparations. A 24 hr minimum period is suggested. The use of Celite in column preparation often results in improperly prepared columns and should be eliminated. Nonreproducible columns might also be due to a heterogeneous water-silicic acid adsorbent which is a result of an irregular distribution of water molecules onto the silicic acid particles. (Holoman-Battelle)
W73-04644

CAMPESTEROL AND BETA-SITOSTEROL CONTENT OF SOME VEGETABLE OILS,
Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.
C. W. Thorpe.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 1085-1087, September 1972. 1 tab, 5 ref.

Descriptors: *Pollutant identification, Chemical precipitation, Oil seed crops, Soybeans, Peanuts, Organic compounds, Separation techniques, Corn (Field).
Identifiers: *Sterols, *Vegetable oils, *Gas liquid chromatography, Campesterol, Beta-sitosterol, Corn oil, Cottonseed oil, Digitonin, Chemical composition.

A digestion precipitation technique, coupled with conversion of the digitonides to the sterol acetates for gas liquid chromatography, was used to determine the free and total campesterol and beta-sitosterol content of 48 samples of crude and refined corn, cottonseed, soybean and peanut oils. The results show that the ratio of beta-sitosterol to campesterol may be used to identify an individual oil and tend to confirm that sterols are lost during refining of the crude oils. It is recommended that the official method, 28.081-28.088, modified for the analysis of campesterol and beta-sitosterol be collaboratively studied. (Mackan-Battelle)
W73-04645

COLLABORATIVE STUDY OF ANALYTICAL METHODS FOR FLUORIDE IN VEGETATION: EFFECTS OF INDIVIDUAL TECHNIQUES ON RESULTS,
Boyce Thompson Inst. for Plant Research, Yonkers, N.Y.
J. S. Jacobson, and D. C. McCune.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 991-1003, September 1972. 4 fig, 3 tab, 24 ref.

Descriptors: *Fluorides, *Quality control, *Statistical methods, *Analytical techniques, *Plant tissues, Chemical analysis, Spectrophotometry, Volumetric analysis, Alfalfa, Grasses, Sorghum, Methodology, Leaves.
Identifiers: *Collaborative studies, *Sample preparation, Ion selective electrodes, Pine needles, Biological samples, Precision.

A collaborative test of analytical methods and techniques for fluoride in samples of vegetation was carried out by 64 participants and effects on the magnitude and variability of analytical results were assessed. When data were grouped according to the techniques employed by the collaborators, statistical analyses indicated that many variations in techniques were affecting the analytical results. Both the data and the information supplied by participants support the following conclusions: (1) An explicit set of instructions, specifically designed for samples of vegetation, should be published to reduce the number of variations in analytical procedures used by different laboratories. (2) The semiautomated method, specifically developed for vegetation samples, is a preferred technique because it is simpler and faster than older methods and gives results comparable to those obtained by the Willard-Winter method. (3) The AOAC official final action method for fluoride may be used for the analysis of vegetation if modifications are made. Results of this collaborative study also suggest that additional studies should be performed to discover why alkaline fixative agents used for ashing affect analytical results and whether simpler and more precise analyses will be obtained by replacing titrimetric or spectrophotometric techniques with the use of the selective ion electrode. (Little-Battelle)
W73-04646

COLLABORATIVE STUDY OF THE OFFICIAL AOAC FLAME PHOTOMETRIC METHOD FOR THE DETERMINATION OF SODIUM IN FERTILIZERS,
L. F. Corominas.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 986-988, September 1972. 3 tab, 5 ref.

Descriptors: *Quality control, *Analytical techniques, *Statistical methods, Instrumentation, *Fertilizers.
Identifiers: Collaborative studies, Precision, Errors.

Two official final action methods for flame photometric analysis of sodium in fertilizers were used by 9 collaborators to analyze prepared samples. A total of 600 results were then evaluated using Youden's method. The evaluation showed one method to be more precise than the other based upon the standard deviation of systematic errors. Results were comparable when different types of flame photometers were used. (Little-Battelle)
W73-04647

COLLABORATIVE STUDY OF AN AUTOMATED METHOD FOR PHOSPHORUS IN FERTILIZERS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development.
F. J. Johnson.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 979-983, September 1972. 1 fig, 3 tab, 22 ref.

Descriptors: *Quality control, *Analytical techniques, Statistical methods, Automation, *Fertilizers.
Identifiers: Collaborative studies, *Method validation, *Errors, T-test, F-test.

A collaborative study was made of an automated method for total and direct available phosphorus (P205) in comparison with the official gravimetric quimociac method. Eight laboratories participated in the analysis of the 13 sample solutions, and the results were evaluated by the technique of closely matched pairs. The t-test showed no difference in the means of the results of the 2 methods. The estimates of the random, systematic, and total errors of the automated method all differed significantly from those of the official method when evaluated by the F-test. (Little-Battelle)
W73-04648

NEUTRON ACTIVATION ANALYSIS OF MERCURY IN FISH, FLOUR, AND STANDARD REFERENCE ORCHARD LEAVES BY ELECTRODEPOSITION RADIOCHEMISTRY,
Food and Drug Administration, Washington, D.C. Division of Chemistry and Physics.
M. W. Heitzman, and R. E. Simpson.
Journal of the Association of Official Analytical Chemists, Vol 55, No 5, p 960-965, September 1972. 2 fig, 1 tab, 6 ref.

Descriptors: *Mercury, *Neutron activation analysis, *Radiochemical analysis, *Freshwater fish, Chemical analysis, Electrolysis, Methodology, Radioactivity techniques, Pikes, Pollutant identification, Heavy metals.
Identifiers: *Electrodeposition, *Orchard leaves, *Biological materials, *Flour, Chemical recovery, Chemical interference, Detection limits, Sample preparation, Chemical digestion, Gamma ray spectrometry, Biological samples, Gas liquid chromatography.

A method for neutron activation analysis of mercury is described in which electrodeposition is used to isolate the mercury carrier in the recovery step. Although the recovery of mercury carrier is variable, the results yielded by this technique are comparable to those obtained using sulfide precipitation in neutron activation analysis. The method was also compared to gas chromatography and atomic absorption techniques and similar results were obtained. No interferences were evident in the samples analyzed: fish, flour, and standard orchard leaves. The method can detect ppb levels of mercury. (Holoman-Battelle)
W73-04649

CONFIRMATION OF PESTICIDE RESIDUE IDENTITY, PART III. DERIVATIVE FORMATION IN SOLID MATRIX FOR THE CONFORMATION OF ENDRIN BY GAS CHROMATOGRAPH,
Department of the Environment, Burlington (Ontario). Water Quality Div.
A. S. Y. Chau.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 169-176, September 1972. 2 fig, 2 tab, 12 ref.

Descriptors: *Water analysis, *Endrin, *Mud, *Gas chromatography, Fish, *Pollutant identification, Separation techniques, *Pesticide residues, Methodology, Chlorinated hydrocarbon pesticides.
Identifiers: *Sample preparation, Cleanup, Biological samples, Chromatograms, Detection limits, Isomerization, Chemical interference.

A simplified method employing a solid matrix for analysis of pesticides has been extended to the confirmation of endrin. The method involves a chemical derivation-gas chromatographic technique. The solid matrix consists of an alumina/sulfuric acid mixture. Extraction and cleanup procedures were described in part. Acid-catalyzed isomerization of endrin in solid matrix is accomplished by adding the sample to a pipette containing sodium sulfate, letting it stand, eluting with benzene, and collecting the eluate in a Kontes concentrator tube for analysis. Application of the method to water, fish, and mud extracts has been routinely used in the author's laboratory. As little as 1 ng of endrin in a cleanup sample can be confirmed with the method. (Little-Battelle)
W73-04651

ENVIRONMENTAL SCIENCE LABORATORY MANUAL,
M. A. Strobbe.
C. V. Mosby Co.: St. Louis, Mo., 138p. Illus. 1972. Paper Pr. $4.25.
Identifiers: *Analytical techniques, Air, Environment, Laboratory manual, Pesticides, *Water analysis.

This manual provides a set of basic analytical procedures commonly used to determine the quality of our environment, and designed to be used in an introductory course in environmental science. The exercises are based on quantitative and qualitative determinations, with procedures explicit enough to allow them to be performed by the nonscience or beginning science student. The content is divided into the following 5 sections: particulate matter and chemical parameters affecting air quality, chemical analysis of water, microbiological examination of water, physical parameters of water and identification of pesticide residues by thin-layer chromatography. Also included are 10 appendices containing the following information: glossary; weight and volume equivalents; effects of particulate matter, of SO2, of NO2 and of CO; air quality standards; surface water criteria for public water supplies; air pollution series of technical publications and federal pollution control agencies.--Copyright 1972, Biological Abstracts, Inc.
W73-04654

RADIOECOLOGICAL INVESTIGATIONS IN A THERMAL SPRING REGION,
Zagreb Univ. (Yugoslavia). Faculty of Sciences.

For primary bibliographic entry see Field 05B.
W73-04659

A NEW METHOD FOR CONCENTRATING PHYTOPLANKTON BY FILTRATION WITH CONTINUOUS STIRRING,
Massachusetts Univ., Gloucester. Marine Station.
I. Morris, and C. S. Yentsch.
Limnology and Oceanography, Vol 17, No 3, p 490-493, May 1972. 1 fig, 4 tab, 9 ref.

Descriptors: *Filtration, *Phytoplankton, Cultures, Carobn dioxide, Pollutant identification, Photosynthesis, Marine Algae, Sea water, Radioactivity techniques, Separation techniques, Methodology, Chlorophyta.
Identifiers: *Continuous magnetic stirring, C-14, Ultrafiltration, Phaeodactylum tricornutum, Tetraselmis, Aphanizomenon holsaticum, Dunaliella tertiolecta, Nannochlors atomus.

Phytoplankton (both natural populations and cultures) have been concentrated 20-fold to 200-fold by passage through an ultrafiltration cell with continuous magnetic stirring. Conditions yielding maximum recovery of physiologically active phytoplankton have been developed. Recovery of C-14-dioxide assimilation activity was comparable to that of chlorophyll, generally varying from 55-75 percent for natural populations and from 70-95 percent for cultures. Modification of the apparatus to give a continuous flow of seawater into the filtration cell would make this method suitable for concentrating 50-60 liters to 100 ml, possibly yielding suspensions which would allow study of the activity of enzymes in cell-free extracts, pathways of carbon dioxide assimilation, rates of respiration, rates of assimilation of inorganic nitrogen compounds, and so on. (Byrd-Battelle)
W73-04660

SIZE SEPARATION OF MARINE SESTON BY MEMBRANE AND GLASS-FIBER FILTERS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
R. W. Sheldon.
Limnology and Oceanography, Vol 17, No 3, p 494-498, May 1972. 3 fig, 3 ref.

Descriptors: *Marine microorganisms, *Size, *Separation techniques, *Seston, Pollutant identification, Sea water, Shape, Retention.
Identifiers: *Glass-fiber filters, *Membrane filters.

A method is presented for the size separation of marine seston by both membrane and glass-fiber filtration. The average minimum sizes of particles retained by metal membranes and perforated polycarbonate membranes were similar to the stated pore sizes when relatively small seawater samples with moderate concentrations of particles were filtered. When large samples or high concentrations were filtered, the average retention size was less than the stated pore size. All cellulose ester membranes (Millipore) retained particles much smaller than the stated pore size, even from small samples with low particle concentrations. Glass-fiber filters had retention characteristics similar to membrane filters. (Byrd-Battelle)
W73-04662

SEPARATING CONSTITUENTS OF NATURAL PHYTOPLANKTON POPULATIONS BY CONTINUOUS PARTICLE ELECTROPHORESIS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
D. R. Bayne, and J. M. Lawrence.
Limnology and Oceanography, Vol 17, No 3, p 481-489, May 1972. 4 fig, 3 tab, 14 ref.

Descriptors: *Phytoplankton, *Aquatic algae, *Plant populations, *Separation techniques, Organic matter, Clays, Bacteria, Hydrogen ion concentration, Movement, Size, Aggregates, Buoyancy, Cyanophyta, Chlorophyta, Euglenophyta, Chrysophyta, Aquatic populations, Pollutant identification, Diatoms, Chlamydomonas, Chlorella, Scenedesmus, Anabaena, Euglena.
Identifiers: *Continuous particle electrophoresis, Ankistrodesmus, Closterium, Golenkinia, Oocystis, Haematococcus, Coelastrum, Dictyosphaerium, Gleoocystis, Pediastrum, Staurastrum, Lyngbya, Aphanizomenon, Oscillatoria, Raphidiopsis, Coelosphaerium, Eucapsis, Microcystis.

A continuous particle electrophoresis (CPE) system was used to isolate components of mixed phytoplankton suspensions. Twenty-one freshwater phytoplankton genera were tested. All algal cells examined migrated toward the anode and different mobilities frequently resulted in fractionation of mixtures of different genera. Organic debris, clay particles, and bacteria often exhibited distinct mobilities that led to their separation from other constituents. Tris (hydroxymethyl) amino methane, pH 9.2, provided greater particle mobility and better resolution than sodium diethylbarbiturate, pH 8.6. Increase in buffer pH tended to make algal particles more negative and increased mobility. A direct relationship existed between applied field gradient and particle mobility. Resolution generally improved at higher field gradients. The effectiveness of the separation was limited by such algal properties as motility, size, formation of aggregates, and buoyancy. (Byrd-Battelle)
W73-04663

PORTABLE SPECTRORADIOMETER FOR UNDERWATER ENVIRONMENTS,
Simon Fraser Univ., Burnaby (British Columbia). Photobiology Group.
For primary bibliographic entry see Field 07B.
W73-04665

COMPARISON OF SAMPLES OF STREAM BOTTOM FAUNA COLLECTED DURING THE DAY AND AT NIGHT,
Alberta Univ., Edmonton. Dept. of Zoology.
H. F. Clifford.
Limnology and Oceanography, Vol 17, No 3, p 479-481, May 1972. 1 tab, 6 ref.

Descriptors: *Biomass, *Streams, *Benthic fauna, *Bottom sampling, Freshwater, Pollutant identification, Photoperiodism, Diurnal distribution, Aquatic insects, Systematics, Immature growth stage, Midges, Diptera, Oligochaetes.
Identifiers: Chironomidae, Hydropsyche, Elmidae, Simuliidae, Dicranota, Arcynopteryx, Nemorua cinctipes, Leptophlebia cupida, Baetis tricaudatus, Caenis simulans, Blackflies, Ostracods, Macroinvertebrates.

Bottom samples were taken throughout the year at 1600 and 2300 hours from a riffle region of a brown-water stream of Alberta, Canada. For the abundant taxa, the variance of numbers was much greater than the mean for both day and night samples. For the entire study period, there were no significant differences between day and night samples for total numbers, total number of taxa, and total volume-biomass. (Byrd-Battelle)
W73-04666

SAMPLING AND ANALYZING TRACE QUANTITIES,
Monsanto Co., Saint Louis, Mo.
J. R. Fair, B. B. Crocker, and H. R. Null.
Chemical Engineering, Vol 79, No 21, p 146-154, September 18, 1972. 6 fig, 4 tab, 18 ref.

Descriptors: *Sampling, *Aqueous solutions, *Chemical analysis, *Methodology, Monitoring, Gases, Liquids, Water analysis, Gas chromatography, Spectrophotometry.
Identifiers: *Trace quantities, Coulometry, Chemiluminescence.

Before a trace component in a process stream can be dealt with effectively, the engineer must obtain a representative sample of the material and have an accurate analysis made. In order to obtain that representative sample, a careful study should be made to ascertain the best way of obtaining the sample and what devices should be used. For meaningful data, recovery of a TQ in the sample-collection device must be essentially 100 percent. If the process stream is monitored for trace quantities, the most desirable way is continuous analysis of the sample and recording of the results. The TQ engineer's concern is with analytical methods and instruments that will give reliable information. Those typical criteria for analytical methods are presented. Some methods of chemical analysis such as gas chromatography, spectrophotometry, chemiluminescence, and coulometry operate on the gas phase alone - whether it be a process stream used directly, or a liquid stream that is vaporized prior to analysis. Liquid-phase analyses include those for measuring gases absorbed or reacted in liquids prior to analysis, as well as those for liquid streams themselves. (Holoman-Battelle)
W73-04667

DETERMINATION OF M-SEC-BUTYLPHENYL N-METHYL-N-THIOPHENYLCARBAMATE (RE-11775) IN WATER, SOIL AND VEGETATION,
California Univ., Riverside. Citrus Research Center and Agricultural Experiment Station.
W. E. Westlake, M. Ittig, and F. A. Gunther.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 109-112, August 1972. 1 tab.

Descriptors: *Gas chromatography, *Thiocarbamate pesticides, *Grasses, *Alfalfa, *Potable water, *Irrigation water, *Bottom sediments, Water analysis, Soil analysis, Larvicides, Mud.
Identifiers: Cleanup, *M-sec-butylphenyl N-methyl-N-thiophenylcarbamate, Sample preparation, Chemical recovery.

Methods were developed for gas chromatographic analysis of m-sec-butylphenyl N-methyl-N-thiophenylcarbamate (RE-11775), a mosquito larvicide, in turbid pond water, irrigation water, tap water, soil, pond bottom mud, grass, and alfalfa at levels of 0.01 ppm. Water samples were extracted by shaking with methylene chloride or chloroform, passing through anhydrous sodium sulfate, evaporating, and dissolving the residue in benzene for GC analysis. Pond water containing decaying organic matter required cleanup consisting of passing the benzene solution through a column of Florisil deactivated by adding 15 percent water and eluting with benzene. Soil samples were mixed with anhydrous sodium sulfate, blended with methylene chloride, filtered, the solvent removed, and the residue dissolved in benzene. The same cleanup procedure for pond water was used. Pond bottom mud which contained decaying organic matter was blended with acetonitrile, filtered, diluted with water, shaken with hexane, evaporated, and the residue dissolved in ethyl acetate. Cleanup was accomplished by adding the sample to a column containing silica gel, ethyl acetate, and Nuchar-Attaclay and eluting with ethyl acetate. Grass and alfalfa were blended with acetonitrile, filtered, diluted with water and sodium sulfate, and equilibrated with hexane. For cleanup, samples were added to a column containing alumina pre-wet with benzene and eluted with benzene. The operating parameters of the gas chromatograph were not critical. Recovery levels from the different samples are shown to be consistent and acceptable. (Little-Battelle)
W73-04670

CHROMOUS CHLORIDE REDUCTION. VII. STEREOCHEMISTRY AND STRUCTURE OF THE MAJOR PRODUCT EMPLOYED IN THE CONFIRMATION OF ENDRIN RESIDUES,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.

For primary bibliographic entry see Field 05B.
W73-04671

CHARACTERIZATION OF THE COMPONENTS OF TECHNICALLY POLYCHLORINATED BIPHENYL MIXTURES-II,
Centraal Instituut voor Voedingsonderzoek TNO, Zeist (Netherlands).
A. C. Tas, and R. J. C. Kleipool.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 1, p 32-37, July 1972. 10 ref.

Descriptors: *Polychlorinated biphenyls, *Gas chromatography, Pollutant identification, Nuclear magnetic resonance, Chromatography, Mass spectrometry.
Identifiers: *Characterization, NMR spectra, Chlorinated hydrocarbons, Infrared spectra, Mass spectra, Chemical structure.

Further analysis of technically polychlorinated biphenyl mixtures by gas chromatography, IR spectra, and NMR spectra has resulted in the identification of three additional products: 2,2',3,3',6,6'-hexachlorobiphenyl; 2,2',3,4',5', 6-heptachlorobiphenyl; and 2,2',3,3',4,5,6'-heptachlorobiphenyl. Four other compounds were identified in an early study. (Little-Battelle)
W73-04675

VOLATILE COMPOUNDS PRODUCED IN GROUND MUSCLE TISSUE OF CANARY ROCKFISH (SEBASTES PINNIGER) STORED ON ICE,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
A. Miller, III, R. A. Scanlan, J. S. Lee, and L. M. Libbey.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1125-1129, August 1972. 2 fig, 1 tab, 20 ref.

Descriptors: *Volatility, *Organic compounds, Ice, Mass spectrometry, Pollutant identification, Commercial fish, Biodegradation, Temperature, Water pollution sources, Analytical techniques, Chemical analysis.
Identifiers: *Muscle, *Rockfish, *Sebastes pinniger, Gas liquid chromatography, Ketones, Olefinic hydrocarbons, Aliphatic hydrocarbons, Sample preparation, Alehydes.

Volatile compounds associated with the progressive biodegradation of ground muscle tissue of canary rockfish (Sebastes pinniger) stored on ice were determined by combined gas-liquid chromatography and mass spectrometry. Samples of canary rockfish were obtained from coastal commercial sources and subsequently packed in ice and stored at O C. Volatile compounds from the spoiling fish ground muscle tissues were collected at varying intervals for analysis. Compounds positively identified included dimethyl sulfide, n-propyl alcohol, acetaldehyde, propionaldehyde, acetone, ethyl alcohol, 2- and 3-pentanone, diacetyl, hexanal, 1-pentene-3-o1, 3-methyl-l-butanol, acetoin, trimethylamine, and dimethylamine. The following compounds were tentatively identified: propenal, octenal or octadienal, butyraldehyde, 3-methyl butanal, 2-butanone, and methyl vinyl ketone. (Byrd-Battelle)
W73-04680

RESPONSE OF A CALCIUM-SELECTIVE ELECTRODE IN ACID SOLUTIONS,
Melbourne Univ., Parkville (Australia). Dept. of Industrial Science.
J. Bagg, and R. Vinen.
Analytical Chemistry, Vol 44, No 11, p 1773-1777, September 1972. 6 fig, 1 tab, 25 ref.

Descriptors: *Calcium, *Electrochemistry, Acids, Aqueous solutions, Ions, Hydrogen ion concentration, Equations, Laboratory equipment, Evaluation, Mathematics, Chemical analysis, Alkali metals, Membranes, Membrane processes, Physicochemical properties.
Identifiers: *Chemical interference, *Ion selective electrodes, Interference potential, Liquid membrane electrode.

A liquid-membrane electrode, selective toward Ca ions, when in contact with aqueous solutions for less than 12 hours, displays an interference by hydrogen ions which is very similar to the interference caused by alkali-metal ions. The interference potential (E) is the difference between observed potential and calculated potential assuming no interference, i.e. E equals RT/F times the natural log of 1 plus the square root of (K sub H A sub H)/A sub Ca, where the selectivity parameter K sub H equals (1.8 plus or minus 0.3) times 10. If the electrode has had only a brief contact with aqueous solutions, the accepted limit on pH for absence of significant hydrogen ion interference may be extended from 5.5 down to 4.0 when Ca (2 plus) is greater than or equal to 0.1. When electrodes which have been in prolonged contact with aqueous solutions are immersed in solutions of pH 3-5, and calcium concentration in the range .1-.0001 molal, an anomalous negative change in potential is observed. Associated with this negative change is the entry of water and calcium salts into the membrane and a slow process probably due to the formation of a barrier layer. (Mackan-Battelle)
W73-04681

TECHNIQUE FOR CHEMICAL IONIZATION OPERATION OF A CEC 21-110B MASS SPECTROMETER,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
For primary bibliographic entry see Field 07B.
W73-04684

SUCCESSIVE PHOTOMETRIC TITRATION OF CALCIUM AND MAGNESIUM,
Yokohama National Univ. (Japan). Lab. for Industrial Analytical Chemistry.
H. Sato, and K. Momoki.
Analytical Chemistry, Vol 44, No 11, p 1778-1780, September 1972. 3 fig, 2 tab, 17 ref.

Descriptors: *Calcium, *Magnesium, *Volumetric analysis, Chemical analysis, Freshwater, Sea water, Trace elements, Heavy metals, Cations, Anions, Chemical reactions, Alkali metals, Spectrophotometry, Pollutant identification, Methodology, Water analysis, Color reaction, Indicators, Copper, Iron, Aluminum, Cobalt, Lead, Strontium, Chelation, Sodium, Potassium, Phosphates, Sulfates, Alkaline earth metals.
Identifiers: *Photometric titration, Sample preparation, Chemical interference, Detection limits, EDTA, Precision, Metal complexes, Absorbance, Nickel, Barium, EGTA, Ethyleneglycol-bis- (2-aminoethylether)-tetraacetic acid, Ethylenediamine-tetraacetic acid.

A new photometric titration method for the determinations of calcium and magnesium is presented. Calcium and magnesium in one solution are titrated with EGTA and DCTA, successively, at pH 11 (glycine-KOH buffer) using Phthalein Complexon as an indicator. The end point for calcium and magnesium can be obtained directly on a successive titration curve (absorbance vs. volume of titrant added). The influences of various foreign ions are studied. Sub-milligram quantities of calcium and magnesium can be determined with standard deviations of 0.5 percent or lower in the presence of many other metal ions. Titration results for city water, well water, and sea water are shown as examples. (Long-Battelle)
W73-04686

STRUCTURAL DETERMINATION OF MONOSUBSTITUTED ALKYLBENZENES BY PROTON MAGNETIC RESONANCE,
Government Chemical Industrial Research Inst., Tokyo (Japan).
O. Yamamoto, K. Hayamizu, K. Sekine, and S. Funahira.
Analytical Chemistry, Vol 44, No 11, p 1794-1803, September 1972. 3 fig, 4 tab, 30 ref.

Descriptors: *Chemical analysis, Pollutant identification, Organic compounds, Aromatic compounds, Gas chromatography.
Identifiers: *Alkyl benzenes, *Proton magnetic resonance spectroscopy, *Chemical structure, PMR spectra, Isomers, Toluene, Ethyl benzenes, Sample preparation, Spectral analysis.

In order to obtain the basic data for the structural determination of monosubstituted alkylbenzenes by PMR, the PMR parameters are determined for 66 such compounds, and the additivity rules for the ring proton chemical shifts and the coupling constants are examined. General features of the ring proton signals in the monosubstituted alkylbenzenes are discussed in detail. A simple method is proposed for presuming the substituent and discriminating the isomers by use of the center of gravity and the pattern features of the ring proton signals. The effect of the alkyl chain on the PMR parameters is also studied. (Long-Battelle)
W73-04687

DETERMINATION OF CHROMIUM IN BIOLOGICAL MATERIALS BY ATOMIC ABSORPTION SPECTROMETRY USING A GRAPHITE FURNACE ATOMIZER,
Bowman Gray School of Medicine, Winston-Salem, N.C.
I. W. F. Davidson, and W. L. Secrest.
Analytical Chemistry, Vol 44, No 11, p 1808-1813, September 1972. 4 fig, 4 tab, 25 ref.

Descriptors: *Chromium, *Chemical analysis, *Pollutant identification, Heavy metals, Urine, Spectrometers, Methodology, Cations, Trace elements, Sodium, Calcium, Copper, Zinc, Iron, Magnesium, Manganese, Potassium, Anions, Chlorides, Iodides, Carbonates, Sulfates.
Identifiers: *Biological materials, *Flameless atomic absorption, *Graphite furnace, Atomic absorption spectrophotometry, Blood plasma, Sensitivity, Detection limits, Tissue, Ashing, Sample preparation, Blood, Precision, Chemical interference, Chemical recovery, Reproducibility, Biological samples.

A microanalytical method for the measurement of chromium in blood plasma, urine, and other biological materials utilizing a flameless atomic absorption technique has been developed. The method combines the inherent specificity and simplicity of atomic absorption analysis with the greatly increased sensitivity possible with the heated graphite tube atomizer to provide a simple, rapid means for the quantitative determination of chromium. The absolute sensitivity of the method is 44 picograms chromium with a detection limit of about 2 picograms chromium. For routine analysis of plasma, the method is effective with either preashed samples or direct sample analysis of very small amounts on the order of 20 to 200 microliters. The relative standard deviation for quantities of chromium ranging from 285 to 690 picograms in 50 microliters of wet ashed plasma is 5.2 percent. (Long-Battelle)
W73-04688

RAPID, PHASE-SENSITIVE, THREE-ELECTRODE ALTERNATING CURRENT POLAROGRAPHY,
Melbourne Univ., Parkville (Australia). Dept. of Inorganic Chemistry.
A. M. Bond, and D. R. Canterford.
Analytical Chemistry, Vol 44, No 11, p 1803-1807, September 1972. 8 fig, 1 tab, 9 ref.

Descriptors: *Polarographic analysis, *Copper, *Cadmium, *Laboratory equipment, Electrodes, Instrumentation, Heavy metals.
Identifiers: *Detection limits, Precision, AC polarography.

Previously, short controlled drop times have been employed with considerable advantage in ac polarography to permit faster scan rates of potential and short recording times. In this work, the possibility of using 3-electrode phase-sensitive detection with this so-called 'rapid' ac polarographic technique has been investigated. Results show that theoretical relationships derived for natural drop time ac polarography can be extended to the rapid ac method. Thus, with 3-electrode phase-sensitive instrumentation, excellent discrimination against the charging current is still obtained at short controlled drop times. In fact, the degree of discrimination under rapid conditions was better than with natural drop time phase-sensitive ac polarography. This was particularly evident at high frequencies. With the rapid phase-sensitive ac technique, copper (II) and cadmium (II) could be detected down to the 0.5-1 micromolar level. The introduction of phase-sensitive readout to the rapid ac technique, therefore, provides a considerable improvement to results reported previously with non phase-sensitive instrumentation. Indeed, the technique appears to be highly attractive in many aspects, having the advantage of permitting fast scan rates, and thus short analysis times, while maintaining excellent discrimination against the charging current. (Holoman-Battelle)
W73-04689

ULTRASONIC NEBULIZATION IN A LOW-EMISSION FLAME FOR ATOMIC FLUORESCENCE SPECTROMETRY,
Illinois Univ., Chicago. Dept. of Chemistry.
M. B. Denton, and H. V. Malmstadt.
Analytical Chemistry, Vol 44, No 11, p 1813-1818, September 1972. 5 fig, 2 tab, 15 ref.

Descriptors: *Heavy metals, *Laboratory equipment, Zinc, Cadmium, Equipment, Instrumentation.
Identifiers: *Atomic fluorescence spectrometry, *Detection limits, *Ultrasonic nebulizer, Precision.

The use of an ultrasonic nebulizer in conjunction with a low turbulence, argon-hydrogen-entrained air flame for atomic fluorescence spectrometry of zinc and cadmium provides improved performance of almost two orders of magnitude as compared with a conventional pneumatic total consumption burner. Increased sensitivity results from more efficient nebulization, reduced light scattering, and lower flame background emission. An automated sample changing system is described which provides the required freedom from sample cross-contamination. While this study made use of a low-temperature flame, improvements should also be observed in other higher-temperature flames. This should be particularly true in cases where the sample is difficult to convert to atomic vapor or when a high concentration of another species would cause salt crystal light scattering. (Little-Battelle)
W73-04690

DETECTION LIMITS IN ANALYSIS OF METALS IN BIOLOGICAL MATERIALS BY LASER MICROPROBE OPTICAL EMISSION SPECTROMETRY,
Stanford Univ., Calif. Dept. of Pathology.
W. J. Treytl, J. B. Orenberg, K. W. Marich, A. J. Saffir, and D. Glick.
Analytical Chemistry, Vol 44, No 11, p 1903-1904, September 1972. 2 fig, 15 ref.

Descriptors: *Heavy metals, *Chemical analysis, *Alkaline earth metals, Spectrometers, Calcium, Magnesium, Iron, Copper, Zinc, Mercury, Lead, Trace elements, Pollutant identification.
Identifiers: *Detection limits, *Optical emission spectrometry, Biological materials, Laser microprobe, Lithium, Sample preparation, Gelatin, Albumin, Sensitivity.

A laser microprobe optical emission spectrometer was tested and compared to other techniques for its sensitivity in the detection of metals in biological samples. Metals, including Li, Mg, Ca, Fe, Cu, Zn, Hg, or PB, were analyzed in 10 micron-thick frozen microtome sections of gelatin which had been prepared in 7 percent human albumin. The detection limits reported for the laser probe detection of the metal were comparable to those of ion microprobe, electron microprobe, neutron activation, and atomic absorption analyses. The laser microprobe can be particularly useful when biological samples of 0.01 microgram are to be measured. (Long-Battelle)
W73-04691

ESTIMATES OF PRIMARY PRODUCTION OFF OREGON USING AN IMPROVED CHLOROPHYLL-LIGHT TECHNIQUE,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. F. Small, H. Curl, Jr., and W. A. Glooschenko.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1261-1267, September 1972. 2 fig, 2 tab, 13 ref.

Descriptors: *Estimating equations, *Primary productivity, *Oregon, *Methodology, Solar radiation, Light penetration, Light intensity, Upwelling, Coasts, Measurement, Sea water, Photosynthesis.
Identifiers: Chlorophyll a.

An existing equation for the estimation of primary production from chlorophyll and light data was examined, and revisions were made to allow more precise applications of the equation to upwelling areas and other regions with relatively large fluctuations in chlorophyll concentration and production per unit of chlorophyll during the day. The revised equation was developed by estimating production in 2-hr increments through the daylight period, and integrating by parts to arrive at production in terms of gC/sq m/day. Total daily production in coastal waters was estimated within plus or minus 13 percent of mean C-14 estimates, on the average, while in offshore waters the estimates averaged within plus or minus 21 percent of mean C-14 estimates. Estimates by the revised equation averaged 52 percent better in coastal waters, and 32 percent better in offshore waters, than the basic unrevised equation. (Mackan-Battelle)
W73-04692

AN AUTOMATIC SYSTEM FOR THE CONTINUOUS DETERMINATION OF ORGANICS IN WATER AND WASTEWATER,
H. Bleier.
Water Research, Vol 6, Nos 4/5, p 605-609, April/May 1972. 5 fig, 1 tab.

Descriptors: *Automation, *Organic wastes, *Analytical techniques, *Instrumentation, Chemical oxygen demand, Carbon, Water analysis, Volumetric analysis, Monitoring, Amino acids, Carbohydrates, Aromatic compounds, Acids, Activated sludge, Pulp wastes, Turbidity, Adsorption, Refractivity, Suspended solids, Chemical analysis, Carbon dioxide, Oxidation, Effluents, Treatment plants, Waste water treatment, Organic compounds.
Identifiers: Strip chart recorder, Sulfuric acid, Potentiometric titration, Recorders, Ketones, Aldehydes, Sensors, Organic carbon.

A new system is described which will automatically measure the concentration of organic matter in waste water. The samples for analysis are mixed and homogenized, sulfuric acid is added, and purified air is used to expel inorganic carbon. After mixing with reagents, the sample goes through a reaction unit where organic carbon is oxidized to carbon dioxide, which is then expelled in a separator unit. Continuous potentiometric titration is used to measure COD in the liquid, and the gas goes to a relative conductometric carbon dioxide analyzer. A strip chart recorder is used to record results. The instrument has been used for automatic continuous measurement of different effluents and for determining TOC in individual samples. More than 80 different pure organic substances have been analyzed and the results of the analysis can be seen within 20 minutes after input. The system reliability is better than plus or minus 0.5 percent. (Mortland-Battelle)
W73-04693

REMOVAL OF METAL IONS BY SOIL,
Greeley and Hansen, Chicago, Ill.
G. R. Wentink, and J. E. Etzel.
Journal Water Pollution Control Federation, Vol 44, No 8, p 1561-1574, August 1972. 2 fig, 14 tab, 4 ref.

Descriptors: *Soils, *Heavy metals, Waste water treatment, *Cation exchange, Ions, Industrial wastes, Chromium, Copper, Zinc, Ion exchange, Clays, Sulfates, Sampling, Soil types, Leaching, Leachate, Loam, Flame photometry, Methodology.
Identifiers: *Metal plating wastes, *Pollutant removal, Venoclysis apparatus, Sodium saturation, Atomic absorption spectrophotometry, Ion exchange capacity.

Ion exchange methods in removing metal plating wastes using different types of soil were investigated. Chrome, copper, and zinc in sulfate forms were chosen as the heavy metal ions for study. Solutions of these compounds were added to samples of three soil types: Xenia silt loam, Chalmers silty clay loam, and Elston loam by introducing them at the top of the soil column at a low hydraulic rate using a venoclysis apparatus. Testing to determine cation exchange capacity was accomplished by the sodium saturation method whereby exchange sites in the soil sample are saturated with sodium and the sodium ions are replaced with ammonia ions. The concentration of recovered sodium is measured by flame photometry and the results are expressed in terms of me/100 g of oven-dry soil. The technique was modified for use on soil containing the test ions with metal ion concentrations measured by atomic absorption methods. Metal ion removal in the three sample types was accomplished by an ion exchange mechanism with exchange capacity increasing with clay mineral content. Chrome in concentrations up to 300 mg/l could be removed completely in all three soils, so could copper after an initial conditioning period. Zinc removal was accomplished at efficiency rates of not less than 99.7 percent. It was also found that regeneration of all three soil types was possible. (Mortland-Battelle)
W73-04694

DETERMINATION OF ALUMINUM IN BIOLOGICAL MATERIAL BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Toronto Univ. (Ontario). Dept. of Medicine; and Toronto Univ. (Ontario). Dept. of Physiology.
S. S. Krishman, K. A. Gillespie, and D. R. Crapper.
Analytical Chemistry, Vol 44, No 8, p 1469-1470, July 1972. 2 tab, 4 ref.

Descriptors: *Aluminum, Chemical analysis, Bioassay, Aqueous solutions, Water pollution, *Pollutant identification, Methodology, Organic matter.
Identifiers: *Atomic absorption spectrophotometry, *Biological samples, Sample preparation, Chemical interference, Tissue, Brain,

Body fluids, Absorbance, Precision, Accuracy, Detection limits, Wet digestion.

A method is described for the determination of aluminum in biological material by atomic absorption spectrophotometry. About 1 gram of wet tissue is dried to constant weight in an oven at 90C. It is then wet digested in a mixture of nitric, sulfuric, and perchloric acids and the final aqueous solution analyzed for aluminum with an atomic absorption spectrophotometer. Absorption measurements made on 50 microgram/ml Al solution in the presence of several ions verified chemical interference by Na, La, Phosphate and ferrous ions, and sulfuric and nitric acids (0.5 percent by volume). The absorption signal was suppressed by about 10 percent. The effect of sodium was stabilized at a concentration of 500 micrograms/ml; the effects of the acids were more pronounced as the concentration was increased. (Byrd-Battelle)
W73-04701

BUNKER C OIL IN SEDIMENTS AND BENTHIC ANIMALS FROM SHALLOW DEPTHS IN CHEDABUCTO BAY, N.S.,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 05B.
W73-04703

SOME ASPECTS OF THE BIOLOGY OF GAMMARELLUS HOMARI (CRUSTACEA, AMPHIPODA) IN THE NORTHWESTERN ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W73-04706

A SURVEY OF THE TOTAL CADMIUM CONTENT OF 406 FISH FROM 49 NEW YORK STATE FRESH WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
R. J. Lovett, W. H. Gutenmann, I. S. Pakkala, W. D. Youngs, and D. J. Lisk.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1283-1290, September 1972. 2 tab, 1 fig, 31 ref.

Descriptors: *Heavy metals, *Pollutant identifications, *New York, *Cadmium, *Freshwater fish, Chemical analysis, Trace elements, Sport fish, Separation techniques, Commercial fish, Pan fish, Brown trout, Brook trout, Bullheads, Carp, Cisco, Drums, Lake trout, Perches, Rainbow trout, White bass, Suckers, Walleye, Striped bass.
Identifiers: *Atomic absorption spectrophotometry, Ashing, Sample preparation, Biological magnification, Bioaccumulation, Biological samples, Whitefish, Black crappie, Bowfin, Coho salmon, Gizzard shad, Goldfish, Muskellunge, Northern pike, Largemouth bass, Smallmouth bass, Sturgeon, Burbot, Chain pickerel, Pomoxis nigromaculatus, Amia calva, Salvelinus fontinalis, Salmo trutta, Ictalurus, Lota lota, Cyprinus carpio, Esox niger, Coregonus artedii, Oncorhynchus kisutch, Aplodinotus grunniens, Dorosoma cepedianum.

Fish from New York State fresh waters were surveyed for total cadmium. Ten gram samples were dry ashed at 485 C using the procedure of Bandemer and Evans, but without the addition of magnesium nitrate. The ash was then dissolved in 0.8 N HCl and analyzed by atomic absorption spectrophotometry using a tantalum boat accessory. The majority of samples contained 20 ppb or below. The remainder showed concentrations up to 100 ppb with only few above this concentration. Fishes from central New York waters rarely contained cadmium greater than 20 ppb. Fish from Adirondack waters contained cadmium above 20 ppb most consistently. These higher concentrations may be related to generally higher background cadmium levels in this Adirondack area where many metallic ore deposits are located with which cadmium is typically associated. Cadmium accumulation only occasionally appeared species-dependent. No relation was obvious between total residues of the metal and size or sex of fish or age of lake trout. The cadmium concentrations observed are comparable to those commonly present in many other foods. (Mackan-Battelle)
W73-04712

A COMPARISON OF CHEMICAL, ISOTOPIC, AND ENZYMATIC METHODS FOR MEASURING NITROGEN ASSIMILATION OF MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05B.
W73-04719

BIOLOGICAL DAMAGE FROM INTRANUCLEAR TRITIUM: DNA STRAND BREAKS AND THEIR REPAIR,
California Univ., San Francisco. Lab. of Radiobiology.
For primary bibliographic entry see Field 05C.
W73-04726

BENTHOS TRAPPED LEAVING THE BOTTOM IN BIDEFORD RIVER, PRINCE EDWARD ISLAND,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 02L.
W73-04727

STABILITY OF ELEMENTAL PHOSPHORUS IN EDIBLE MUSCLE TISSUE OF COD DURING PROCESSING INCLUDING ICING, FREEZING AND THAWING, FROZEN STORAGE, SALTING, AND COOKING,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05B.
W73-04730

STATISTICAL EXPRESSION OF EFFLUENT QUALITY STANDARDS,
Water Pollution Research Lab., Stevenage (England).
A. B. Wheatland.
Water Research, Vol 6, Nos 4/5, p 339-340, April/May 1972. 2 tab.

Descriptors: *Effluents, *Sewage treatment, Biochemical oxygen demand, Statistical methods, Water quality control, Mathematical studies, Standards, Suspended solids.
Identifiers: *Data interpretation, River Trent.

Samples from 14 sewage works were collected over a one year period, analyzed for suspended solids and BOD, and the results statistically analyzed. The data calculated included: (1) annual mean for each works and (2) the concentrations which were exceeded on 5, 50 and 95 percent of the days. A plot of these data showed an essentially linear relationship between the annual mean and the corresponding percentiles. The results showed that in order to ensure that an effluent would have a biochemical oxygen demand less than 20 mg/l for 95 percent of the time it would be necessary to design a works to produce an effluent having an average BOD no greater than 11 mg/l. Also to ensure that the suspended solids content of the effluent was less than 30 mg/l for 95 percent of the time it would be necessary to design the sedimentation tanks and the rest of the plant so that the concentration of suspended solids would be on average no greater than 17 mg/l. (Snyder-Battelle)
W73-04732

MOBILIZATION OF MERCURY FROM SEDIMENTS INTO GUPPIES (POECILLIA RETICULATA),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05B.
W73-04736

WATER QUALITY CONDITIONS IN THE CHESAPEAKE BAY SYSTEM,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
T. H. Pheiffer, D. K. Donnelly, and D. A. Possehl.
Environmental Protection Agency Region III, Annapolis Field Office Technical Report 55, August 1972. 303 p, 48 fig, 55 tab.

Descriptors: *Water quality, *Chesapeake Bay, *Tributaries, *Chemical analysis, *Water analysis, Sampling, Data collections, Water pollution sources, Industrial wastes, Water quality standards, Maryland, Virginia, District of Columbia, Nutrients, Dissolved oxygen, Alkalinity, Hydrogen ion concentration, Pesticides, Coliforms, Phosphates, Nitrates, Trace elements, Estuaries, Sedimentation.

Existing water quality conditions in the Chesapeake Bay and its tidal tributaries are delineated and water quality data and monitoring programs are evaluated in the context of a Bay management program. The study areas are the Lower Susquehanna River, Upper Bay and Upper Eastern Shore, Upper Western Shore, Baltimore Harbor, Middle Western Shore, Middle Chesapeake Bay, Middle Eastern Shore, Lower Eastern Shore, Patuxent River, Potomac River, Rappahannock River, York River, James River, and Lower Chesapeake Bay waters. The available water quality information is assessed for each study area with specific reference to the following parameters: bacterial densities, dissolved oxygen, nutrients, heavy metals, and pesticides. Where sufficient data exist, as in the case of the Potomac Estuary, water quality trends are identified and their significance discussed. Inventories of industrial and municipal waste-water discharges are discussed. Based on nutrient input studies of the major tributary watersheds of the Chesapeake Bay, the Susquehanna River is the largest contributor of nutrients to the Bay. (Woodard-USGS)
W73-04784

PLATING MEDIUM PH AS A FACTOR IN APPARENT SURVIVAL OF SUBLETHALLY STRESSED YEASTS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 05C.
W73-04816

ERYTHRITOL AS A SELECTIVE SUBSTRATE FOR THE GROWTH OF SERRATIA MARCESCENS,
Cedars-Sinai Medical Center, Los Angeles, Calif.
For primary bibliographic entry see Field 05C.
W73-04817

DEMONSTRATION OF RHODANESE ACTIVITY IN POLYACRYLAMIDE GELS,
Connecticut Univ. Health Center, Hartford.
J. R. Murphy, J. Frankenfeld, J. Calvert, and R. C. Tilton.
Applied Microbiology, Vol 24, No 2, p 283-285, August 1972. 1 fig, 10 ref.

Descriptors: *Pollutant identification, *Electrophoresis, Cultures, Enzymes, Microorganisms, Aerobic bacteria, Methodology, Isolation.
Identifiers: *Polyacrylamide gels, *Thiobacillus, *Staining, *Rhodanese, Dichloroindophenol, Methylphenazonium methodsulfate, Sample preparation, Streptomycin sulfate.

Rhodanese activity from crude extracts of Thiobacillus sp. strain IV-85 was demonstrated in polyacrylamide gels after incubation in the reaction mixture by staining with dichloroindophenol in the presence of methylphenazonium methosulfate. The sensitivity of the staining system was found to be 0.8 micromoles of sulfite. Due to the specificity of the procedure for the presence of sulfite, the detection of enzymes of either the sulfur oxidation pathway, or the sulfate reduction pathway, which produce sulfite, could be possible with appropriate alteration of the reaction mixture. (Long-Battelle)
W73-04818

USE OF POLYELECTROLYTES AND ELECTRON MICROSCOPY FOR DETECTION OF VIRUSES FROM STOOL,
Ottawa Univ. (Ontario). Dept. of Microbiology and Immunology.
B. K. Chaudhary, and J. C. N. Westwood.
Applied Microbiology, Vol 24, No 2, p 270-274, August 1972. 3 fig, 3 tab, 11 ref.

Descriptors: *Electron microscopy, *Pollutant identification, *Polyelectrolytes, *Adsorption, Isolation, Viruses, Microorganisms, Electron microscopy, Efficiencies, Separation techniques.
Identifiers: Sample preparation, Poliovirus, Coxsackie virus, Feces, Biological samples, Recovery.

Experiments were conducted to evaluate the use of insoluble electrolytes (PE 60) for concentrating viruses from stool specimens experimentally inoculated, as well as those obtained from patients infected with enterovirus. Virus in stool specimens were first concentrated with PE 60, eluted from the PE 60, and detected under an electron microscope. Preferential adsorption of viruses to PE 60 was maximum at a pH range of 4.5 to 6, and the elution of viruses was optimum at pH 8.5. Concentrations of PE 60 for adsorption of viruses from 10 ml stool specimens was 35 mg, where 88 and 69 percent viral adsorption was obtained from non-clinical and clinical specimens, respectively. Best results were obtained when adsorption was carried out at 25 C. (Long-Battelle)
W73-04819

THE VARIABILITY OF OCEANOGRAPHIC OBSERVATIONS OFF THE COAST OF NORTH--WEST AFRICA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
P. G. W. Jones.
Deep-Sea Research, Vol 19, No 6, p 405-431, June 1972. 11 fig, 1 tab, 10 ref.

Descriptors: *Coasts, *Africa, *Variability, *Physiochemical properties, *Upwelling, Saline water, Oceanography, Nutrients, Plankton, Chemical analysis, Water sampling, Computer programs, Water analysis, Salinity, Phosphates, Silicates, Nitrates, Dissolved oxygen, Chlorophyll, Water temperature.
Identifiers: *Cape Blanc, Shipboard measurements, Salinometers, Sample preservation.

During May-June 1969 two sections, 30 nautical miles apart, were worked off the coast of northwest Africa near Cape Blanc. Temperature, salinity, phosphate, silicate and nitrate were recorded to a depth of 500 meters using standard equipment and techniques. Both sections were worked on three occasions, separated by periods of 50 and 77 hours, respectively. Considerable variation in the distribution of the parameters was observed, both between successive surveys of the same section and also between the two sections of the same survey. Observations were also made over a period of 24 hours at two locations on the edge of the continental shelf, and marked variation with time in the distribution of the parameters was recorded at both locations. The nature of the variability is discussed in the light of the upwelling process operating throughout the period of observation. (Byrd-Battelle)
W73-04821

AN INEXPENSIVE VERSATILE INCUBATOR FOR SOIL BIOLOGICAL RESEARCH,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 07B.
W73-04822

STOMACHING: A NEW CONCEPT IN BACTERIOLOGICAL SAMPLE PREPARATION,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
A. N. Sharpe, and A. K. Jackson.
Applied Microbiology, Vol 24, No 2, p 175-178, August 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Coliforms, *Foods, *Fish, *Isolation, Enteric bacteria, Separation techniques.
Identifiers: *Sample preparation, *Biological samples, *Homogenization, Stomaching.

An entirely new mixing device, particularly suitable for preparing bacterial suspensions from foods, fabrics, swabs, and other fairly soft materials, has been developed. With this technique the sample and diluent are put into an inexpensive, sterile plastic bag which is vigorously pounded on its outer surfaces by paddles when placed inside the machine. The resulting compression and shearing forces effectively remove even deep-seated bacteria. After samples are taken for analysis the bag and its remaining contents are thrown away. Labor involved in cleaning and sterilizing reusable homogenizer cups or probes is eliminated, and the device is immediately ready for reuse. Running costs are thus drastically reduced, compared with conventional homogenizers. Additional advantages of this device, which is simple and inexpensive to manufacture, are low noise level, negligible temperature rise, and the small storage space required for bags. Coliform counts in samples of beef cuts, chicken, comminuted meats, processed beef, pastry, vegetables, and fish prepared by this method compared favorably with those in samples prepared by conventional techniques. (Little-Battelle)
W73-04823

SYNCHRONY INDICES BASED ON COMPUTER-CORRECTED ALGAL CELL DATA,
Saint Louis Univ., Mo. Dept. of Biology.
D. W. Rooney.
Mathematical Biosciences, Vol 14, Nos. 1/2, p 59-64, June 1972. 2 fig, 8 ref.

Descriptors: *Algae, *Digital computers, Equations, Computer programs, Computer models, Cultures, Automation, Automatic control, Data processing, Efficiencies.
Identifiers: *Synchrony index.

A method is described that utilizes the decision-making capability of a digital computer to detect and correct probable errors in algal cell counts used for synchrony index computations. The computer uses appropriate criteria to identify and alter points on a log cell number versus time plot incongruous with neighboring points. Repeated simulations have been employed to test the effectiveness of the method in eliminating the positive bias in index values computer from imprecise counts. The effectiveness of the method has been found to vary inversely with the degree of synchrony in an algal culture--the less the synchrony, the more the remaining bias. (Byrd-Battelle)
W73-04824

AUTOMATED REACTION-RATE METHODS OF ANALYSIS,
Illinois Univ., Urbana. Roger Admas Lab.
For primary bibliographic entry see Field 07B.
W73-04825

MICROWAVE SPECTROSCOPY,
Waterloo Univ. (Ontario). Dept. of Chemistry.
F. W. Karasek.
Research/Development, Vol 23, No 9, p 38-40, September 1972. 5 fig, 8 ref.

Descriptors: *Laboratory equipment, *Pollutant identification, Chemical analysis, Equipment, Monitoring, Instrumentation, Chemical compounds, Absorption, Microwaves.
Identifiers: *Microwave spectroscopy, *Mixtures, *Microwave rotational resonance, *Chemical composition, MRR spectra, Dipole moment.

Microwave rotational resonance spectroscopy (MRR) occurs in the high frequency, long wavelength spectral region where only purely rotational molecular changes are found. The spectra are unique, and such a high degree of resolution can be achieved that each compound of a complicated mixture has many specific, narrow absorption bands. This resolution of absorption bands allows chemical identification according to specific rotational and bond characteristics. Band intensity contains the quantitative information and is a function of the permanent dipole moment magnitude and the numbers of molecules in the lower energy state of transitions. Applications in trace-gas pollutant monitoring and the analysis of complex mixtures are now underway. (Mackan-Battelle)
W73-04826

RATIO MATCHING--A STATISTICAL AID FOR DISCOVERING GENERIC RELATIONSHIPS AMONG SAMPLES,
Dow Chemical Co., Midland, Mich.
O. U. Anders.
Analytical Chemistry, Vol 44, No 12, p 1930-1933, October 1972. 3 fig, 4 tab, 6 ref.

Descriptors: *Sediments, *Heavy metals, *Industrial wastes, *Correlation analysis, Neutron activation analysis, Statistical methods, Path of pollutants, Copper, Zinc, Gold, Cadmium, Mercury, Chromium, Michigan, California.
Identifiers: *Data interpretation, *Fingerprinting, Arsenic, Antimony, Ratio matching.

A statistical technique of matching the ratios of elemental concentrations of a sample with the equivalent ratios of other samples can provide correlations which indicate potential generic relationships among samples. The technique is applied by calculating 'concentration ratios' which are obtained by dividing the concentration of each element by that of each element. These data are used to construct a 'concentration ratio matrix'. The ratios for two samples can be compared by forming a 'ratio matrix of the two samples'. This triangular matrix is obtained by dividing each of the elements of the 'concentration ratio matrix' for one sample by those of another. This ratio can be reduced to an element of a 'correlation matrix', whose elements are defined as the proportion of elements in the ratio matrix which meet a 'matching criterion'. The statistical significance of a correlation between two samples is then evaluated by carrying out correlation between random samples of the same type. The technique was evaluated by applying it to data obtained from neutron activation analysis of As, Sb, Cu, Zn, Au, Cd, Hg and Cr in 91 sediment samples from Michigan and California waterways. One potential application of the method is fingerprinting of wastes from certain industries. (Little-Battelle)
W73-04827

COMPUTER CONTROLLED STROPPED-FLOW STUDIES - APPLICATION TO SIMULTANEOUS KINETIC ANALYSES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
D. Sanderson, J. A. Bittikofer, and H. L. Pardue.

Analytical Chemistry, Vol 44, No 12, p 1934-1939, October 1972. 7 fig, 1 tab, 21 ref.

Descriptors: *Computers, *Automatic control, Heavy metals, Control systems, Data collections, Aqueous solutions, Pollutant identification, Data processing, Nickel, Organic acids, Amino acids, Cations, Chemical reactions.
Identifiers: *Stopped-flow spectrophotometry, *Exchange reaction kinetics, Thiolactic acid, Cysteine, Metal complexes, Metal chelates, Mixtures.

Kinetic data are used to develop analytical methodology for the simultaneous, computer controlled, stopped-flow spectrophotometric determination of cysteine and thiolactic acid in mixtures of the two. The design and construction of a fully automatic stopped-flow instrument featuring a computer controlled sample preparation unit, a newly designed sampling system, and real time data collection and treatment are described. The instrument is used for a kinetic study of the exchange reaction between a Ni (II)-citrate complex and thiol acids. Information obtained from this study is used to develop an analytical procedure for the simultaneous determination of two thiol acids, cysteine and thiolactic acid in mixtures. Samples of thiol acids were determined quantitatively in the concentration range of .00001 M to .0001 M. Results for the two-component systems are included. (Byrd-Battelle)
W73-04828

CONVERSATIONAL MASS SPECTRAL RETRIEVAL SYSTEM AND ITS USE AS AN AID IN STRUCTURE DETERMINATION,
National Institutes of Health, Bethesda, Md. Div. of Computer Research and Technology.
For primary bibliographic entry see Field 02K.
W73-04829

COMPUTER ACQUISITION AND ANALYSIS OF GAS CHROMATOGRAPHIC DATA,
American Cyanamid Co., Stamford, Conn. Central Research Div. Labs.
For primary bibliographic entry see Field 07C.
W73-04830

CURCUMIN METHOD FOR SPECTROPHOTOMETRIC DETERMINATION OF BORON EXTRACTED FROM RADIOFREQUENCY ASHED ANIMAL TISSUES USING 2-ETHYL-1,3-HEXANEDIOL,
Indiana Univ., Bloomington. Dept. of Chemistry.
J. W. Mair, Jr., and H. G. Day.
Analytical Chemistry, Vol 44, No 12, p 2015-2017, October 1972. 2 tab, 13 ref.

Descriptors: *Spectrophotometry, *Boron, Chemical analysis, Resins, Separation techniques, Pollutant identification, Methodology, Trace elements.
Identifiers: *Curcumin method, *Radiofrequency ashing, *Animal tissues, *Biological materials, 2-ethyl-1 3-hexanediol, Sodium tetraborate decahydrate, Borax, Sample preparation.

Work on the nutritional significance of boron in animals required the development of a sensitive and accurate method for its determination at the submicrogram level. The method developed (Curcumin method) requires gentle combustion of animal tissues in a low temperature radiofrequency excited oxygen plasma followed by extraction from a 1 N HCl solution of the ash using 2-ethyl-1,3-hexanediol in chloroform (10 percent v/v). Boron in the organic phase is converted to the highly absorbing rosocyanin complex using glacial acetic acid (0.375 percent w/v) followed by concentrated sulfuric acid. The concentrate is diluted with 95 percent ethanol and subsequently analyzed spectrophotometrically. Beer's law was obeyed down to 0.002 microgram/ml, and the method exhibits a total error of about 10 percent over concentrations ranging between 0.002 and 0.020 microgram/ml. Data show that 100.3 plus or minus 5.1 percent of the standard Borax added to the unashed tissue samples was recovered. The use of XE-243 boron-specific resin proved to be a convenient, quantitative means for concentrating as little as 1 microgram of boron from large volumes of solution. (Byrd-Battelle)
W73-04831

PHOTOELECTRON SPECTRA OF PHOSPHORUS HALIDES, ALKYL PHOSPHITES AND PHOSPHATES, ORGANO-PHOSPHORUS PESTICIDES, AND RELATED COMPOUNDS,
University Coll. of Swansea (Wales). Dept. of Chemistry.
D. Betteridge, M. Thompson, A. D. Baker, and N. R. Kemp.
Analytical Chemistry, Vol 44, No 12, p 2005-2010, October 1972. 5 fig, 1 tab, 18 ref.

Descriptors: *Pollutant identification, *Organophosphorus pesticides, Chemical analysis, Phosphorus compounds, Halides, Agricultural chemicals, Phosphates.
Identifiers: *Ultraviolet photoelectron spectroscopy, *Spectrochemical analysis, Dichlorvos, Disulfoton, Butonate, Photoelectron spectra, Phosphites.

The photoelectron spectra of 15 phosphorus-containing compounds including the pesticides Dichlorvos, Disulfoton, and Butonate, have been obtained by UV-photoelectron spectroscopy. The spectra of the compounds are sufficiently different to allow qualitative identification based on the molecular orbital theory, the symmetry of phosphorus and ligand orbitals, and by comparison of the spectra of less complex molecules such as simple phosphorus halides. Instrument memory and side reaction effects were observed during measurement. Compound involatility and molecular complexity increased the difficulty of investigation. (Mackan-Battelle)
W73-04832

MAXIMIZATION OF SENSITIVITIES IN TANTALUM RIBBON FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Instrumentation Lab., Inc., Lexington, Mass.
J. Y. Hwang, C. J. Mokeler, and P. A. Ullucci.
Analytical Chemistry, Vol 44, No 12, p 2018-2021, October 1972. 3 fig, 2 tab, 15 ref.

Descriptors: *Heavy metals, *Aqueous solutions, Gold, Beryllium, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Mercury, Potassium, Cesium, Magnesium, Manganese, Lead, Strontium, Titanium, Air, Laboratory equipment, Instrumentation, Aluminum, Trace elements, Zinc.
Identifiers: *Biological samples, *Detection limits, *Flameless atomic absorption spectrophotometry, Blood, Rubidium, Selenium, Europium, Gallium, Silicon, Tin, Tellurium, Vanadium, Thallium, Antimony, Bismuth, Precision, Sensitivity, Barium, Indium.

Four parameters, composition of purge gas, temperature, flow rate of purge gas, and height of measurement, which affect the sensitivity of atomic absorption spectrometry were studied with the aim of maximizing performance. An Instrument Laboratory Inc. Model 253 double beam AA spectrophotometer modified with an atomization chamber containing a tantalum ribbon as a heating element was used to analyze aqueous solutions of 37 metals. Argon, helium, nitrogen and hydrogen were used as purge gases. Data from the analyses show that detection limits for the metals range from 10 to .0001 ng. It is concluded that it is important to optimize the temperature and height measurement and the chemical composition, thermal characteristics, and flow rate of the purge gas to achieve maximum sensitivity in the flameless technique reported. The technique is easy to use, sensitive, and has good precision (2-4 percent rel std dev) at the nanogram level. It will be useful in the analysis of the trace and ultratrace elements in biological samples and air particulate samples since the technique provides excellent sensitivities and consumes only a few microliters of sample solutions. Applications of the technique to directly determine Cr, Ni, Mn, Be, and Pb in human sera and blood samples are available. (Little-Battelle)
W73-04833

REDUCTION OF A MATRIX EFFECT IN SPARK SOURCE MASS SPECTROMETRY USING A SOLUTION DOPING TECHNIQUE,
Kennecott Copper Corp., Lexington, Mass. Ledgemont Lab.
R. J. Guidoboni, and C. A. Evans, Jr.
Analytical Chemistry, Vol 44, No 12, p 2027-2030, October 1972. 1 fig, 6 tab, 7 ref.

Descriptors: *Chemical analysis, *Aqueous solutions, Water pollution, Pollutant identification.
Identifiers: *Solution doping, *Matrix effect, Quantitative analysis, *Spark source mass spectrometry, Mass spectra, Chemical interference.

A sensitive and comprehensive method is developed for the analysis of major, minor and trace species using spark source mass spectrographic techniques when a comparative standard is not available. The technique employs simple solution doping, which permits quantitative analysis through the use of synthetic standards. The method was applied to the analysis of several NBS standards with precision of plus or minus 8-10 percent and average deviations from certified values of plus or minus 10 percent. The technique can be employed for the analysis of a wide variety of materials including metals, minerals, semiconductors and powders. Easily prepared standards can be used for the quantitative analysis of aqueous solutions such as might be encountered in water pollution analysis. (Byrd-Battelle)
W73-04834

PRODUCTION AND ANALYSIS OF SPECIAL HIGH-PURITY ACIDS PURIFIED BY SUB-BOILING DISTILLATION,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
E. C. Kuehner, R. Alvarez, P. J. Paulsen, and T. J. Murphy.
Analytical Chemistry, Vol 44, No 12, p 2050-2056, October 1972. 4 fig, 7 tab, 8 ref.

Descriptors: *Acids, *Distillation, *Trace elements, *Heavy metals, Storage, Lead, Strontium, Zinc, Copper, Nickel, Iron, Chromium, Calcium, Potassium, Magnesium, Sodium, Laboratory equipment.
Identifiers: *Ultrapure water, *Spark source mass spectrometry, Impurities, Tellurium, Barium, Thallium, Tin, Silver, Nitric acid, Hydrochloric acid, Hydrofluoric acid, Perchloric acid, Sulfuric acid, Production.

Sub-boiling distillation from pure quartz or Teflon (Du Pont) stills has been investigated for the production of high-purity inorganic acids and water. Nitric, hydrochloric, hydrofluoric, perchloric, and sulfuric acids produced by this method contained significantly lower cationic impurities than high-purity acids from commercial sources. A complete system, including the Class 100 environment, production, and storage of these high-purity reagents is described. A method based on spark source mass spectrographic isotope dilution analysis has been developed for the simultaneous determination of 17 elements in these materials. Results of the analyses of both the acids purified by sub-boiling distillation and the ACS reagent grade acids used as starting materials are reported. The sum of the common impurity elements determined

in the purified acids ranged from 2.3 ppb in nitric acid to 27 ppb in sulfuric acid. No element in any of the purified acids exceeded 10 ppb and most were well below the 1-ppb level. (Little-Battelle)
W73-04835

USE OF THE MICROWAVE-EXCITED EMISSIVE DETECTOR FOR GAS CHROMATOGRAPHY FOR QUANTITATIVE MEASUREMENT OF INTER-ELEMENT RATIOS,
Imperial Coll. of Science and Technology. London (England). Dept. of Chemistry.
R. M. Dagnall, T. S. West, and P. Whitehead.
Analytical Chemistry, Vol 44, No 12, p 2074-2078, October 1972. 4 fig, 1 tab, 11 ref.

Descriptors: *Gas chromatography, *Organic compounds, *Organophosphorus compounds, *Sulfur compounds, Instrumentation, Chlorides, Iodides, Phosphates, Sulfides, Bromides, Iodine, Phosphorus compounds, Laboratory equipment.
Identifiers: *Microwave emission detectors, *Iodine compounds, *Bromine compounds, Chromatographs, Inter-element ratios, Phosphites, Carbon tetrachloride, Coloroform, Dichloromethane, Trichloroethylene, Tetrachloroethylene, Ethyl chloride, Chlorobenzene, Dichloroethane, Methyl iodine, Ethyl iodine, n-propyl iodide, Amyliodide, Iodobenzene, Triethylphosphite, Trimethylphosphate, Trimethylphosphite, Triethyiphosphate.

The detector system of a gas chromatograph was modified by the use of a narrow, water-cooled, three-quarter wave microwave cavity for use in determining inter-element ratios. Two apertures on opposite sides of the cavity were used for monitoring the discharge with a Beckman DU monochromator fitted with a 960IB photomultiplier and a low resolution Hilger and Watts monochromator fitted with an R166 solar blind photomultiplier. The responses of the two photomultipliers were recorded simultaneously. In the investigation of compounds of carbon and chlorine, iodine, phosphorus, sulfur, or bromine, one monochromator was set to the emission wavelength of atomic carbon and the other set for the emission characteristics of the particular heteroatom. The results showed that the use of the simple expedient of simultaneously monitoring emission from two atomic lines can be used to determine the quantitative relationship between the heteroatoms and the number of carbon atoms in the compound. In each instance the measured ratio was found to be independent of carrier gas flow rate and concentration. The results obtained from chlorine- and bromine-containing compounds can be satisfactorily explained on the basis that the emitting species are diatomic (C12 and Br2). The ratios of chlorine or bromine emission to atomic carbon emission were both carrier gas flow rate and concentration dependent. The analytical utility of this technique is clearly limited by the sensitivities of the detectors to the elemental emissions monitored and by the relative interference of other elements at these wavelengths. The use of microwave-excited atomic emissions for the determination of inter-element ratios is considered to offer a valuable aid in the identification of unknown eluates in gas chromatography. (Little-Battelle)
W73-04836

CALCULATION OF RETENTION VOLUMES IN GRADIENT ELUTION ADSORPTION CHROMATOGRAPHY,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia).
M. Popl, V. Dolansky, and J. Mostecky.
Analytical Chemistry, Vol 44, No 12, p 2082-2084, October 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Organic compounds, *Estimating equations, Adsorption, Chemical analysis.
Identifiers: *Retention volumes, *Mixtures, *Gradient elution adsorption chromatography, Benzene, Naphthalene, Biphenyl, Anthracene, Alumina, Adsorbents, Eluents, Organic solvents, p-Terphenyl.

A simple method is presented for calculating the retention volumes of solute components in the gradient elution of mixtures. This calculation is advantageous for consideration of the separability of individual components thereby allowing for adjustment of the gradient course, without experimental data, to achieve maximum separation in adsorption elution chromatography. The equations of Snyder and his co-workers (1964-1969) are used as the basic relationship for the calculation. Experimentally, model mixtures of benzene-naphthalene-anthracene and benzene - biphenyl - para - terphenyl were used on either neutral or acid alumina with a gradient of n-pentane-ethyl ether for measured and calculated volumes for the mixture components analyzed. (Mackan-Battelle)
W73-04837

PRELIMINARY RESEARCH ON THE LIPOLYTIC BACTERIAL PSYCHROPHILES OF SOIL AND WATER, (RECHERCHES PRELIMINAIRES SUR LES BACTERIES LIPOLYTIQUES PSYCHROPHILES DES SOLS ET DES EAUX),
Ottawa Univ. (Ontario). Dept. of Biology.
C. Breuil, and A. M. Gounot.
Canadian Journal of Microbiology, Vol 18, No 9, p 1445-1451, September 1972. 5 tab, 18 ref.

Descriptors: *Soil bacteria, *Aquatic bacteria, *Pollutant identification, Pseudomonas, Assay, Glacial soils, Aquatic soils, Water temperature, Soil temperature.
Identifiers: *Psychrophilic bacteria, *Lipolytic bacteria, Culture media, Thermal tolerance.

Different soil extract media and other media were assayed for a comparative evaluation of both total and lipolytic populations of bacteria taken from soil and water samples during winter. By incubating at a low temperature, psychrophilic microorganisms were counted and isolated. Gram-negative bacteria, especially Pseudomonas species, were the most numerous. (Holoman-Battelle)
W73-04838

DEVELOPMENT OF A MATHEMATICAL MODEL TO PREDICT THE ROLE OF SURFACE RUNOFF AND GROUNDWATER FLOW IN OVERFERTILIZATION OF SURFACE WATERS,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 05B.
W73-04839

GELATIN AS A MATRIX FOR A MERCURY REFERENCE MATERIAL,
Eastman Kodak Co., Rochester, N.Y. Industrial Lab.
D. H. Anderson, J. J. Murphy, and W. W. White.
Analytical Chemistry, Vol 44, No 12, p 2099-2100, October 1972. 2 tab, 3 ref.

Descriptors: *Mercury, Stability, *Neutron activation analysis, Heavy metals, Storage, Spectrophotometry.
Identifiers: *Reference samples, *Collaborative studies, *Atomic absorption spectrophotometry, Biological samples, Gelatin, Sample preparation, Sample preservation, Tissue, Detection limits, Preconcentration, Chemical digestion.

Gelatin produced by hydrolysis of collagen from animal bones and hides has been found to be useful as a mercury reference material in the determination of mercury in plant and animal tissues. Gelatin is particularly useful for this application since it contains trace quantities of elements likely to be encountered in the biological samples being analyzed. Reference material is prepared by drying to determine the moisture content of the gelatin, reconstituting by adding water and mercury standard solution, drying, and pulverizing. Reference samples were analyzed by seven laboratories in a preliminary study and later by 18 laboratories using atomic absorption and neutron activation techniques. The results were in good agreement with the expected values, indicating that the reference material was homogeneous. It was found that 1 ppb of mercury in gelatin could be determined by neutron activation analysis without preconcentration. By combusting the sample and collecting the mercury on a thin film of gold, it was possible to detect 1 ng of mercury by atomic absorption. An alternative preparation for AA involved digesting the gelatin in hot nitric acid. Investigation of the stability of the samples showed that they remained relatively unchanged after one year when stored in air tight bottles in a desiccator. Gelatin also appears promising as a carrier for other elements. (Little-Battelle)
W73-04840

INFRARED SPECTROPHOTOMETRIC DETERMINATION OF SMALL AMOUNTS OF LACTIC AND PYRUVIC ACIDS,
Bologna Univ. (Italy).
A. Riva, and M. Bisognani.
Analytical Chemistry, Vol 44, No 12, p 2101, October 1972. 1 fig, 4 ref.

Descriptors: *Organic acids, *Chemical analysis, *Aqueous solutions, Organic compounds, Resins, Pollutant identification.
Identifiers: *Infrared spectrophotometry, *Lactic acid, *Pyruvic acid, Reproducibility, Detection limits, Sensitivity, Amberlite resin, Internal reflection spectroscopy, Infrared spectra, 2-hydroxypropanoic acid; 2-oxopropanoic acid.

Due to the problem of detection and quantitative analysis of lactic and pyruvic acids using the Dolinsky and Wilson IR absorption method, a more suitable method has been devised based on the IRS (Internal Reflection Spectroscopy) technique. A known quantity of either acid was dissolved in distilled water and a volume of an ethanolic solution of Amberlite LA-2 was added. The solvents were then distilled under reduced pressure. With this procedure the spectrum of Amberlite as well as the spectra of combined Amberlite and either acid was tested. Quantitative and qualitative spectra were recorded with a Perkin-Elmer IR spectrophotometer equipped with an FMIR unit (Frustrated Multiple Internal Reflection). Reproducibility of the method was found to be fully satisfactory and the smallest absolute amount detected was 2.5 mg of either acid. Sensitivity may be further improved by reducing the amount of resin for each initial concentration of acid and employing micro internal reflection accessories. (Holoman-Battelle)
W73-04841

SPECTROPHOTOMETRIC DETERMINATION OF URANIUM (IV) WITH POTASSIUM IRON (III) CYANIDE,
Wayne State Univ. Detroit, Mich. Dept. of Chemistry.
K. H. Gayer, and H. T. Lifshitz.
Analytical Chemistry, Vol 44, No 12, p 2104-2107, October 1972. 4 fig, 5 tab, 4 ref.

Descriptors: *Spectrophotometry, *Aqueous solutions, *Color reactions, *Chemical reactions, Cations, Organic compounds, Reduction (Chemical), Potassium, Sodium, Ammonium salts, Strontium, Chromium, Magnesium, Lead, Hydrogen ion concentration, Heavy metals.
Identifiers: *Uranium, *Potassium ferricyanide, Chemical interference, Uranyl, Organic reagents, Barium, Absorbance.

A fast spectrophotometric procedure which alleviates the need for extraction has been developed for the determination of U (IV) in aqueous solution in the presence of a large excess of uranyl ion and organic reagents. With this method the aqueous U (IV) solution is reacted with the ferric ion (ferric chloride) in acid medium to yield the ferrous ion which is then reacted with potassium ferricyanide to produce a small dark complex. This complex has the characteristics of a luish solution and is subject to reproducible spectrophotometric absorption of visible light. Solutions of U (IV) or Fe (II) concentrations higher than 0.01 mM and 0.425 M, respectively, have a tendency to form an aggregate precipitate rather than the dilute colloidal suspension needed for accurate spectroscopic determination. Chemical interference by the cations Ca, Mg, and Pb was observed; any species that reduces Fe (III) under the conditions of this method will interfere. (Holoman-Battelle)
W73-04842

CHEMICAL ENRICHMENT AND EXCLUSION WITH ION EXCHANGE MEMBRANES,
Wisconsin Univ., Madison. Dept. of Chemistry.
W. J. Blaedel, and T. R. Kissel.
Analytical Chemistry, Vol 44, No 12, p 2109-2111, October 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Ion exchange, *Permselective membranes, Hydrogen ion concentration, Temperature, Thin films, Aqueous solutions, Anodes, Cathodes, Reservoirs, Heavy water, Alkalis (Bases), Pollutant identification, Cations, Monomolecular films, Ammonia.
Identifiers: Glass electrodes, Monovalent cation electrodes, Saturated calomel reference electrodes, Co-ions, Ion selective electrodes, Sensitivity, Ammonium ions.

Chemical gating, exclusion, and enrichment of ionic species by ion exchange membranes are illustrated by noting the response of a membrane-wrapped, ion selective electrode when it is dipped into various solutions. A sulfonated fluorocarbon cation exchanger and an inert polyvinyl alcohol (PVA) membrane having no exchange sites were wrapped around four types of electrodes: flat glass, combination glass, monovalent cation, and saturated calomel reference electrodes. After a PVA spacer film was added to the electrode to act as a combination spacer and reservoir for inside solution, a calibrated and rinsed wrapped electrode pair was immersed in 100 ml of a solution containing an ion to which the electrode was directly (heavy water or ammonium ions) or indirectly (hydroxide ions) sensitive in order to illustrate enrichment or the speed of ion preparation. Electrode response was recorded as a function of time after immersion, and was taken as an indication of how fast the concentration of the sensed ion built up in the inside solution. Some systems were chosen to illustrate the slowness of co-ion penetration, while others were chosen to illustrate the rapid penetration of counter ions or their enrichment in the inside solution. In general, all of the experiments demonstrate that ion exchange membranes show high permeability to counter ions and virtually no permeability to co-ions in dilute solutions. Permselectivity of the ion-exchange membranes resulted in short-time enrichment effects of counter ions ranging from 5 to 100 for the systems studied, which may be of analytical use in sampling and in increasing the sensitivity of ion-selective electrodes. (Byrd-Battelle)
W73-04843

INTERFERENCE BY COPPER (II) IN DETERMINATION OF MOLYBDENUM (VI) USING TOLUENE-3,4-DITHIOL,
New South Wales Dept. of Agriculture (Australia). Biological and Chemical Research Inst.
P. J. Milham, A. Maksvytis, and B. Barkus.
Analytical Chemistry, Vol 44, No 12, p 2102-2104, October 1972. 2 fig, 1 tab, 16 ref.

Descriptors: *Copper, *Molybdenum, *Chemical analysis, Heavy metals, Pollutant identification, Cations, Aqueous solutions, Methodology, Spectrophotometry, Solvent extractions.
Identifiers: *Toluene-3 4-dithiol, *Chemical interference, *Biological materials, Sample preparation, Atomic absorption spectrophotometry.

An experiment was conducted to examine the effect of copper, in the absence of masking agents, on the determination of molybdenum using dithiol. Individual and combined effects caused by variations in the concentration of Cu, Mo, and HCl were separated. The ratios of Cu to Mo cover the range most often encountered during analysis of biological and mineral materials. One hundred sixty-eight unique combinations of Cu, Mo, HCl were prepared in duplicate; each solution was mixed with dithiol and allowed to stand, with occasional shaking, at 20 plus or minus 5 C, for an hour. Reagent grade isoamyl acetate was added, the mixture shaken, and the liquid phases separated by centrifugation. Mo was spectrophotometrically determined in the isoamyl extract and Cu in the filtered aqueous phase using atomic absorption spectrophotometry. The precipitate was digested to dryness with HN03 and HCl04 and the residue dissolved in dilute HCl. The resulting solution was analyzed for molybdenum and copper. Copper (II) reduces the amount of extractable MoD3 only if copper dithiolate is precipitated. The resulting loss of molybdenum was analytically significant for Cu to Mo ratios (w/w) as small as 1/1 in 0.5-5 M HCl. Higher acid concentrations increase the copper tolerance and with 10 M HCl the interference was negligible at the highest Cu-to-Mo ratio tested (400/l). (Holoman-Battelle)
W73-04844

ULTRATRACE LEVEL DETECTION OF MERCURY BY AN X-RAY EXCITED OPTICAL FLUORESCENCE TECHNIQUE,
Ames Lab., Iowa.
A. P. D'Silva, and V. A. Fassel.
Analytical Chemistry, Vol 44, No 12, p 2115-2116, October 1972. 3 fig, 9 ref.

Descriptors: *Mercury, *X-ray fluorescence, *Irradiation, *Methodology, Heavy metals.
Identifiers: *Optical fluorescence, Environmental samples, Optical spectra, Detection limits, Reproducibility.

A new technique is reported which has the capability of quantitatively determining Hg at nanogram (ppb) levels. Observations made in earlier experiments concerning the behavior of the Hg spectrum under X-ray excitation and in an argon-nitrogen gas mixture were used in developing this technique. A Hg vapor generation system similar to that used in atomic absorption analysis was continuously flushed by an Ar-1 percent N2 gas mixture. The Hg vapor released into this gas was fed to a 2-mm i.d. quartz tube placed in a Pb-shielded enclosure. The wide open end of the discharge tube at the top was sealed with a Mylar film to facilitate X-ray irradiation of the gases. A tungsten target X-ray tube (OEG-50, Machlett Laboratories, Springdale, Connecticut) operated varying power levels was used in these experiments. A 5-cm length of the 2-mm i.d. discharge tube was focused on the slit of a 0.25-meter Jarrel-Ash grating spectrometer. The spectral features were recorded using instrumentation already described... The fluorescent signals obtained from 3 different 10-ppb level (10 ng/ml) experiments indicate that the method is reproducible. The detection limit of this technique is expected to be at the fractional ppb level since a number of experimental variables remain to be optimized. (Holoman-Battelle)
W73-04845

KINETIC BEHAVIOR OF ENZYMES IMMOBILIZED IN ARTIFICIAL MEMBRANES,
Wisconsin Univ., Madison. Dept. of Chemistry.
W. J. Blaedel, T. R. Kissel, and R. C. Boguslaski.
Analytical Chemistry, Vol 44, No 12, p 2030-2037, October 1972. 4 fig, 22 ref.

Descriptors: *Membrane processes, *Enzymes, *Organophosphorus pesticides, *Assay, Kinetics.
Identifiers: *Sample preparation.

Steady state flux and distribution equations are presented to show how enzymes fixed in gels may be used for analysis or for the study of immobilized enzyme kinetics. Experimental support of the equations has been obtained with urease in three systems: a membrane-covered sensor, a membrane separating two solutions, and a membrane immersed in a solution. The relative merits of the three systems for analysis and for the determination of rate constants for the immobilized enzyme are examined. It has been shown in the past that one use of immobilized enzymes in analytical devices is for assaying organophosphorus insecticides through their inhibition of the hydrolysis of a fluorogenic ester with chorinesterase immobilized in a starch gel. (Little-Battelle)
W73-04846

DETERMINATION OF SILVER IN PRECIPITATION DOWN TO 10 TO THE MINUS 11 POWER M CONCENTRATIONS BY ION EXCHANGE AND NEUTRON ACTIVATION ANALYSIS,
Nevada Univ., Reno. Desert Research Inst.
J. A. Warburton, and L. G. Young.
Analytical Chemistry, Vol 44, No 12, p 2043-2045, October 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Precipitation (Atmospheric), *Ion exchange, *Neutron activation analysis, *Water analysis, Chemical analysis, Stable isotopes, Silver iodide, Chemical reactions, Water pollution, Pollutant identification, Snow, Radioactivity techniques.
Identifiers: *Silver, Gamma ray spectrometry, Detection limits, Silver radioisotopes, Radioactive decay.

Thermal neutron activation analysis has been used to determine the concentration of silver in precipitation. The (n, gamma) reaction for Ag-109 and Ag-110 was used, the determinations being made by gamma-ray spectrometry using the 24-second half-life Ag-110 radioisotope. The silver content of precipitation in the eastern Sierra of the United States was generally in the concentration range of 0.2-0.6 picomoles. Evidence indicates that this natural 'background' concentration of silver increases by about a factor of 10 east to the Rockies. Samples collected in mountainous areas where silver iodide is being released for weather modification purposes contained silver in concentrations as much as 0.2-0.6 picomoles. To effect detection of silver at these low concentrations, sample enrichment by ion-exchange was used prior to activation. (Byrd-Battelle)
W73-04847

A SIMPLIFIED SEPARATION OF STRONTIUM, RADIUM, AND LEAD FROM ENVIRONMENTAL MEDIA BY PRECIPITATION FOLLOWED BY FRACTIONAL ELUTION,
National Radiation Lab., Christchurch (New Zealand).
L. P. Gregory.
Analytical Chemistry, Vol 44, No 12, p 2213-2215, October 1972. 9 ref.

Descriptors: *Chemical precipitation, *Separation techniques, *Strontium, *Lead, Heavy metals, Water analysis, Cation exchange, Strontium radioisotopes, Radium radioisotopes, Soil analysis, Foods, Chemical analysis, Calcium, Radioactivity techniques.
Identifiers: *Environmental samples, *Biological materials, *Radium, Chemical digestion, Ion exchange resins, Pb-210, Sr-90, Ra-226, Barium, Lead radioisotopes, Bone, Tissue, Eluents, Chemical recovery, Sr-89, Sample preparation.

Successful separations of strontium, radium, and lead from biological and environmental samples have been achieved with nitric acid at about the strength of the common laboratory reagent, 16 N (70 percent w/w). The difficulties inherent in multiple separations using fuming nitric acid and in the alternative ion exchange methods have been overcome by a simple and reliable two-stage procedure. In the first stage, the insoluble alkaline earth carbonate or phosphate precipitate is separated from the sample and dried. A single treatment using laboratory reagent 70 percent HN03 reduces the calcium content to about the same amount as the added strontium carrier. In the second stage, the resulting dilute solution of calcium, strontium, and impurities is sorbed on a small column of cation exchange resin. Fractional elution of the strontium using ammonium lactate solution at room temperature gives radiochemically pure strontium in high yield. A logical development of this method is the procedure for determining the three long-lived bone-seeking radionuclides, Pb-210 (t sub 1/2 22 yr), Sr-90 (t sub 1/2 28 yr), and Ra-226 (t sub 1/2 1600 yr) in the one sample of bone ash. Advantage is taken of the insolubility of lead, radium, and barium (used to carry the radium) in 70 percent HN03. The nitric acid separation thus becomes a preparatory step for the sequential separation of these radionuclides from the same column by fractional elution using ammonium acetate, ammonium lactate, and alkaline EDTA eluents, respectively. (Holoman-Battelle)
W73-04848

RAPID DIAGNOSIS FOR STREPTOCOCCUS AGALACTIAE AND STREPTOCOCCUS UBERIS,
Forest Products Lab., Madison, Wis.
A. R. Smith, and S. M. Johnston.
Journal of Milk and Food Technology, Vol 35, No 6, p 383-384, June 1972. 1 tab, 3 ref.

Descriptors: Aerobic bacteria, Cultures, Milk, Sampling, Pollutant identification, Aqueous solutions, Pathogenic bacteria, Isolation.
Identifiers: *Streptococcus agalactiae, *Streptococcus uberis, *TKT-ferric citrate medium, Colonies, Blood agar, Hemolysis, Culture media, Selective media.

In comparison with other media the TKT-ferric citrate medium lends itself well for use in a rapid screening method for Streptococcus agalactiae and Streptococcus uberis isolation and identification from milk samples in that: (a) nonprofessional technicians can rapidly identify positive colonies as S. agalactiae or S. uberis on initial isolation; (b) additional confirmatory tests (CAMP, etc.) are usually unnecessary, thereby reducing labor and media costs; and (c) the medium is selective for streptococci and inhibitory to contaminants thereby increasing the number of isolations. (Byrd-Battelle)
W73-04850

BACTERIOLOGICAL QUALITY AND OCCURRENCE OF VIRBIOS IN DUNGENESS CRABMEAT IN OREGON PROCESSING PLANTS AND MARKETS,
Oregon State Univ., Corvallis. Dept. of Foods and Nutrition; and Oregon State Univ., Corvallis. Dept. of Home Economics Research.
E. C. Allen, and M. Woodburn.
Journal of Milk and Food Technology, Vol 35, No 9, p 540-543, September 1972. 2 tab, 19 ref.

Descriptors: *Commercial shellfish, *Crabs, *Oregon, *Marine bacteria, *Food processing industry, *Enteric bacteria, Marine animals, Pollutant identification, Foods, Animal parasites, Animal pathology, Cultures, Streptococcus.
Identifiers: *Vibrio parahaemolyticus, *Cancer magister, Macroinvertebrates, Halophilic bacteria, Fecal streptocci.

Dungeness crabmeat samples from Oregon processors and retail markets were analyzed for Vibrio parahaemolyticus, numbers of fecal streptococci, and aerobic total plate count. Samples were collected from three processors during one commercial season. Five of 31 samples of crabmeat from Oregon retail markets and 4 of 75 crabmeat samples from Oregon processors were positive for halophilic vibrios. Positive samples from processors were raw crabmeat and picked crabmeat. The numbers of fecal streptococci in crabmeat from both processors and retail markets were generally within the guideline of less than 1000 organisms per gram of crabmeat. The median aerobic total plate count of 1.2 million organisms per gram for the crabmeat samples from retail markets was above the limit of 100,000 organisms per gram established by New York City and used elsewhere. The median plate count of to-be-packed crabmeat from processors remained within this limit. (Mackan-Battelle)
W73-04852

DIFFERENTIATION BETWEEN PSEUDOMONAS TESTOSTERONI AND P. ACIDOVORANS BY GAS CHROMATOGRAPHY,
Center for Disease Control, Atlanta, Ga.
J. B. Brooks, R. E. Weaver, H. W. Tatum, and S. A. Billingsley.
Canadian Journal of Microbiology, Vol 18, No 9, p 1477-1482, September 1972. 2 fig, 1 tab, 11 ref.

Descriptors: *Gas chromatography, *Pollutant identification, Pseudomonas, Aerobic bacteria, Water pollution sources, Urine, Soil contamination, Soil bacteria, Organic compounds, Organic acids.
Identifiers: *Pseudomonas testosteroni, *Pseudomonas acidovorans, *Biochemical characteristics, Culturing techniques, Culture media, Commonas terrigena, Gas liquid chromatography, Flame ionization gas chromatography, Biochemical tests, Body fluids, Blucose, d-Xylose, Mannitol, Lactose, Sucrose, Maltose, Levulose, Substrate utilization.

A study was made of the possibility of distinguishing Pseudomonas testosteroni and P. acidovorans by gas liquid chromatography and to test the homogeneity of strains identified by other methods. All strains of both species were distinguished from each other on the basis of levulose (d-fructose) and mannitol utilization. Several growth media were tested to select a medium on which the organisms would produce the most characteristic metabolic profiles with the least background interference from volatile compounds. Twenty milliliters of spent culture medium from each of the above tests were acidified with H2SO4, heated for 1 hr at 80 C, cooled under tap water and extracted with ethyl ether to test for acids and hydroxy acids as butyl esters and trifluoroacetic anhydride (TFA) butyl esters by flame ionization gas chromatography. Acids from cultures were tentatively identified by comparing retention times of unknown compounds on both polar and nonpolar columns with retention times of known standards. Pseudomonas acidovorans was distinguished from P. testosteroni by gas chromatography on the basis of acids detected after 20 hr growth on heart infusion agar plates. The data support the findings of other workers that P. acidovorans and P. testosteroni are two different species and indicate that gas chromatography may be used effectively to distinguish other members of the genus. (Holoman-Battelle)
W73-04853

A SIMPLE COMPUTER-SPECTROPHOTOMETER INTERFACE,
Wake Forest Univ., Winston-Salem, N.C. Dept. of Physics.
For primary bibliographic entry see Field 07C.
W73-04859

COMPOSITE DILATOMETER FOR MEASURING DENSITY OF LIQUIDS AND SOLIDS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
For primary bibliographic entry see Field 07B.
W73-04860

INHIBITION OF FUNGAL GROWTH IN THE CULTURAL ISOLATION OF MYCOBACTERIA,
Agricultural Research Service, Ames, Iowa.
R. S. Merkal, and W. D. Richards.
Applied Microbiology, Vol 24, No 2, p 205-207, August 1972. 2 tab, 7 ref.

Descriptors: *Antibiotics (Pesticides), *Fungicides, *Isolation, *Pathogenic bacteria, *Pollutant identification, Cultures, Fungi, Organic compounds, Inhibitors, Separation techniques, Microbiology, Microorganisms, Aerobic bacteria, Growth rates.
Identifiers: *Mycobacterium, Mycobacterium avium, Mycobacterium bovis, Mycobacterium intracellulare, Mycobacterium paratuberculosis, Mycobacterium phlei, Mycobacterium tuberculosis, Amphotericin B, Cycloheximide, Nystatin, Tetracycline, Mycobacterium fortuitum, Culture media, Benzalkonium chloride, Inhibition, Sample preparation.

Antifungal antibiotics were compared to determine their usefulness in primary mycobacterial cultures. Amphotericin B was found to be more effective in preventing fungal growth from bovine fecal specimens than were cycloheximide, nystatin, and tetracycline. Amphotericin B did not affect the growth rate of the following Mycobacterium species: M. avium, M. bovis, M. intracellulare, M. paratuberculosis, M. phlei, or M. tuberculosis, but it inhibited the growth of M. fortunitum. There was no observable effect on numbers of colonies of M. paratuberculosis on primary isolation from fecal specimens. It is recommended that, for the primary isolation of pathogenic mycobacteria from specimens likely to contain fungi, the inoculum should be pretreated with benzalkonium chloride, followed by mixing with amphotericin B or inoculation onto media containing amphotericin B. (Long-Battelle)
W73-04862

SEQUENTIAL ESTIMATION OF THE SIZE OF A POPULATION,
University Coll. London (England).
For primary bibliographic entry see Field 07B.
W73-04864

CHEMICAL ANALYSES OF SUSPENDED PARTICULATE MATTER COLLECTED IN THE NORTHEAST ATLANTIC,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
C. Copin-Montegut, and G. Copin-Montegut.
Deep-Sea Research, Vol 19, No 6, 445-452, June 1972. 5 fig, 3 tab, 13 ref.

Descriptors: *Chemical analysis, *Atlantic Ocean, *Sea water, Carbon, Iron, Aluminum, Phosphorus, Water pollution, Pollutant identification, Filtration, Organic matter, Depth, Phosphates, Water sampling, Surface waters.
Identifiers: *Particulate matter, Silicon, Sample preparation, Organic carbon.

Chemical analyses of suspended particulate matter have been carried out on samples from different depths between 0 and 4000 m, in the northeast Atlantic. The total mass of suspended matter, particulate organic carbon, silicon, iron, aluminum, and phosphorus were determined by standard chemical methods. In surface waters (0-150 m), the average concentration in particulate matter (mass per vol) is 3.8 higher than between 150 and 4000 m. For carbon the ratio is 4.5 and for phosphorus 10.8. On the other hand, silicon, aluminum and iron are often as abundant in deep water as in the surface layer. (Byrd-Battelle)

W73-04866

A NEW TYPE OF PLANKTON PUMP ON THE VACUUM PRINCIPLE,
Kiel Univ. (West Germany).
For primary bibliographic entry see Field 07B.
W73-04867

PHENOTYPIC PROPERTIES OF A LARGE--CELL, RADIATION-RESISTANT STRAIN OF ESCHERICHIA COLI,
Argonne National Lab., Illinois.
M. J. Kvetkas, R. E. Krisch, and M. R. Zelle.
Canadian Journal of Microbiology, Vol 18, No 9, p 1417-1425, September 1972. 3 fig, 3 tab, 26 ref.

Descriptors: *E. coli, *Pollutant identification, *X-rays, *Resistance, *Irradiation, *Biological properties, Growth rates, Aerobic bacteria, Coliforms, Ultraviolet radiation, Durability, Bacteriophage, Marking techniques, Chemical analysis, Enteric bacteria.
Identifiers: *Mutants, *Phenotype, Culture media, Survival, Substrate utilization, DNA, Bacterial physiology, Biochemical properties, Polyvinylpyrrolidone technique, Sample preparation.

Mean cell volumes, total amount of deoxyribonucleic acid (DNA), number of nuclear bodies, and X-ray responses were determined for exponential cultures of Escherichia coli P6, a large-cell, radiation-resistant mutant strain, and for E. coli 82/r, the parent strain of P6, growing in three different media at varying growth rates. Combined results comparing cultures in the same growth medium indicated that exponentially growing P6 cells are 2.5 plus or minus 0.2 times larger, contain 3.6 plus or minus 0.3 times more DNA, and 1.8 plus or minus 0.1 times more nuclear bodies than comparable 82/r cells. Individual P6 nuclear bodies contained 2.01 plus or minus 0.13 times as much DNA as 82/r nuclear bodies in comparable cultures, suggesting that each P6 nuclear body may contain two complete 82/r genomes. All P6 cultures gave sigmoidal X-ray survival curves with extrapolation numbers averaging 2.0 and with limiting slopes smaller in absolute value than the slopes of the exponential survival curves obtained for 82/r cultures. P6 cells appeared to be no more efficient than 82/r cells in enzymatic dark repair of X-ray or ultraviolet damage, suggesting that the greater X-ray resistance of P6 cells may be associated with the doubled DNA content of each P6 nuclear body. (Long-Battelle)
W73-04868

GROWTH MODELS OF CULTURES WITH TWO LIQUID PHASES. VI. PARAMETER ESTIMATION AND STATISTICAL ANALYSIS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-04869

GROWTH MODELS OF CULTURES WITH TWO LIQUID PHASES. VII. SUBSTRATE DISSOLVED IN DISPERSED PHASE; EFFECT OF DISPERSED PHASE VOLUME AND TEMPERATURE,
Ceskoslovenska Alkademie Ved, Prague. Inst. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-04870

BACTERIA WHICH ATTACK PETROLEUM HYDROCARBONS IN A SALINE MEDIUM,
Naval Weapons Center, China Lake, Calif. Michaelson Labs.
For primary bibliographic entry see Field 05B.
W73-04874

ON THE PROBLEM OF CALIBRATION,
Agricultural Research Council, Edinburgh (Scotland). Unit of Statistics.
For primary bibliographic entry see Field 07B.
W73-04878

SUBSAMPLING A MIXTURE OF SAMPLED MATERIAL,
Commonwealth Scientific and Industrial Research Organization, Newtown (Australia). Div. of Mathematical Statistics.
For primary bibliographic entry see Field 07C.
W73-04879

ALTERNATIVE MULTI-LEVEL CONTINUOUS SAMPLING PLANS,
Rutgers - The State Univ., New Brunswick, N.J. Statistics Center.
For primary bibliographic entry see Field 07C.
W73-04880

SIZE-BIASED SAMPLING,
Florida Univ., Gainesville. Dept. of Statistics.
For primary bibliographic entry see Field 07B.
W73-04881

MERCURY AND OTHER METALS IN URBAN SOILS,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
Environmental Science and Technology, Vol 6, No 6, p 560-562, June 1972. 4 fig, 1 tab, 3 ref.

Descriptors: *Mercury, *Heavy metals, *Sampling, *Soil analysis, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Nickel, Lead, Zinc, Industrial wastes, Michigan, Agricultural wastes, Statistical methods, Fallout, Air pollution, Asphalt, Water pollution sources, Chemical analysis, Cities.
Identifiers: *Atomic absorption spectrophotometry, Silver, Standard methods, Sample preparation, Sample preservation, Asphalt industry.

A study of the concentration of mercury and 10 other metals in soil samples was conducted in an area of varied land use surrounding Grand Rapids, Michigan. Other metals analyzed were silver, calcium, cadmium, cobalt, chromium, copper, iron, nickel, lead, and zinc. The region included industrial, agricultural, residential, and airport areas, as well as unimproved wooded land. Two-inch cores of surface soil were taken from 264 sites, avoiding golf courses and institutional lawns, where mercurials may have been used for treatment. The samples were freeze-dried, homogenized, and screened, and were oxidized at room temperature with nitric acid and potassium permanganate. Atomic absorption spectrophotometry was used for mercury analysis and standard techniques were used to determine the other metals. All of the metals were more concentrated in industrial soils and all except calcium and lead were more concentrated in agricultural than in residential soils. One well-developed fallout pattern for mercury was attributed to an asphalt plant. (Mortland-Battelle)
W73-04885

MERCURY UPTAKE BY POLYAMINE-CARBOHYDRATES,
Western Regional Research Lab., Berkeley, Calif.
For primary bibliographic entry see Field 05B.
W73-04886

RELATIONSHIP BETWEEN ATMOSPHERIC CARBON DIOXIDE AMOUNT AND PROPERTIES OF THE SEA,
Texas A and M Univ., College Station. Dept. of Physics.
For primary bibliographic entry see Field 02K.
W73-04887

FACTORS AFFECTING THE DETERMINATION OF AVAILABLE SOIL NITROGEN BY CHEMICAL METHODS: I. COMPARISON OF EXTRACTABLE WITH MINERALIZED NITROGEN,
Louvain Univ. (Belgium).
For primary bibliographic entry see Field 02G.
W73-04891

A COMPARISON OF METHODS FOR THE DETERMINATION OF SOIL ORGANIC PHOSPHOROUS,
Lincoln Coll. (New Zealand).
For primary bibliographic entry see Field 02G.
W73-04962

PRECONCENTRATION TECHNIQUES FOR TRACE ANALYSIS VIA NEUTRON ACTIVATION,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
J. M. Rottschafer, R. J. Boczkowski, and H. B. Mark, Jr.
Talanta, Vol 19, No 2, p 163-172, 1972.
Identifiers: Metals, *Neutron activation analysis, Pollutants, *Trace metals, *Pollutant identification.

The recent concern over metal pollutants in the environment has resulted in increased efforts to develop satisfactory analytical procedures for determining trace metals in natural systems. A review is given of the methods that were proposed for enrichment of trace elements in samples that are to be analyzed by neutron-activation methods. The emphasis is on classification of methods, with full illustrations by means of practical examples.--Copyright 1972, Biological Abstracts, Inc.
W73-05001

LOSSES OF MERCURY FROM CHLORINE PLANTS: A REVIEW OF A POLLUTION PROBLEM,
Wisconsin Univ., Madison. Dept. of Chemical Engineering.
R. Caban, and T. W. Chapman.
American Institute of Chemical Engineers Journal, Vol 18, No 5, p 892-903, September 1972. 3 fig, 7 tab, 53 ref.

Descriptors: *Mercury, *Industrial wastes, *Pollutants, *Water pollution sources, Chemicals, Chlorine, Spectrophotometry, Pollutant identification, Effluents, Recycling.
Identifiers: *Mercury-cell chlorine plant.

Environmental pollution by industrial discharges of mercury is discussed from the process engineer's point of view, with concentration on the largest contributors to mercury pollution: the mercury-cell chlorine plants. These emissions could not be controlled until recently because of problems in locating where the mercury was escaping, analyzing quantities, and devising effective containment and recovery techniques. Many of these problems remain unsolved due to the unusual chemical and physical properties of mercury. The Chlorine-Caustic Soda plant is described in detail, and 8 possible mercury loss sites are illustrated with a flow diagram. Several mercury measurement methods were given, but the flameless atomic absorption (AA) spectrophotometric was most desirable. Several gas sampling precautions were cited including: absorption of mercury in a concentrated (2% w/v KMnO4) permanganate. Many recent techniques for recovering mercury from gaseous, liquid and solid effluents were described along with recommendations for an integrated recycle system. (Morparia-Texas)
W73-05023

CHEMICAL PROPERTIES OF THE PRETO DA EVA RIVER, AMAZON: A PRELIMINARY STUDY, (IN PORTUGUESE),
Instituto Nacional de Pesquisas da Amazonia, Manaus (Brazil).

U. D. Santos, A. Dos Santos, and W. L. F. Brinkmann.
Cienc Cult (Sao Paulo), Vol 23, No 5, p 643-646. 1971. Illus. English summary.
Identifiers: Amazon, Brazil, Chemical properties, Minerals, *Preto-Da-Eva River, *Water quality, Hydrogen ion concentration.

Analytical work included: pH, specific electrical conductance, Ca, Mg, hardness, alkalinity, total phosphates, nitrates, total Fe, Mn, silica, color, chemical O2 demand and humic matter. The waters were extremely low in carbonates, nitrates, and total phosphates, i.e., the nutrient cycles of these components in the tropical rain forest of the Rio Preto da Eva catchment area are considerably closed.--Copyright 1972, Biological Abstracts, Inc.
W73-05115

CALCULATION OF THE ERROR FOR A ZOOPLANKTON COUNT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 07B.
W73-05149

ANALYSIS OF LEACHED WATERS UNDER CONTROLLED CONDITIONS (IN SPANISH),
Instituto de Investigaciones Geologicas, Edafologicas y Agrobiologicas de Galicia, Santiago (Spain).
For primary bibliographic entry see Field 02K.
W73-05175

SPECTROPHOTOFLUORIMETRIC ASSAYS AND FLUORESENCE-MICROSCOPIC OBSERVATIONS OF 3,4-BENZOPYRENE ON ORGANS AND TISSUES OF CARASSIUS AURATUS (IN ITALIAN),
Bologna Univ. (Italy). Instituto di Zoplogia.
A. Scaccini, M. Cicatelli Scaccini, F. Marani, and V. Leonardi.
Note Lab Biol Mar Pescafano. Vol 3, No 6, p 105-141. 1970. English summary.
Identifiers: Assays, *Benzo pyrene, *Carassius-Auratus, Carcinogens, Fluoresence, *Fluorometric analysis, Gonadal, Liver, Metabolism, Muscle, Organs, Tissues, *Pollutant identification.

In view of the fact that it is well known that wide areas of the sea are polluted by 3,4 benzopyrene a highly carcinogenic substance and that many animals living in water, sometimes including fishes, contain it in their organs research was done to determine whether fishes fed with polluted food accumulate the hydrocarbon, in which organs and tissues it becomes fixed, whether it is metabolized and eliminated and within how long a period of time. Carassius auratus was chosen as the animal for the experiment owing to the ease with which it can be kept in an aquarium. Chemical determination of the hydrocarbon by spectro photofluorimetry and histological studies fluorescence microscopy were done in various organs and tissues. After 4 experiments, in the course of which the gold fishes were fed with various foods containing different doses of benzopyrene and also varying periods of time, the compound was absorbed by the blood and distributed into various organs, becoming fixed electively in the liver, gonads and muscles. The elimination of at least part of the compound ingested and not metabolized takes place through the mesonephros. Other organs such as the heart, bile, natatorial vesicle, brain, and scales, were carcinogen free. When feeding with treated food is protracted for several days, the quantities of the compound present in the organs of the animals under study increase, whereas, when administration is halted the amounts decrease, but, after 2 days, the hydrocarbon is still present indicating that its metabolism or elimination is very slow. Within the general framework of the rules aimed at preserving the integrity of nature, it may be possible to find and apply methods and systems suitable to eliminate this type of defilement of fresh and sea waters to protect mankind from a most dreadful disease.--Copyright 1972, Biological Abstracts, Inc.
W73-05200

5B. Sources of Pollution

SOIL AND WATER MANAGEMENT FOR SALINITY CONTROL,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga, G. A. O'Conner, and H. E. Dregne.
Available from the National Technical Information Service as PB-214 560, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute; Technical Completion Report No 018, 1972. 70 p, 34 fig, 9 tab, 22 ref, 1 append. OWRR C-2165 (no 3376) (1), C-1630 (no 3148) (1), C-1361 (no 1973) (1).

Descriptors: *Salinity, *Groundwater quality, *Soil management, *Soil water movement, *New Mexico, Saline soils, *Water quality, Saline water, Leaching, Infiltration, Pesticides, Lysimeters, *Water pollution, *Hysteresis, Path of pollutants.
Identifiers: *Salinity control, *Salt movement, *Water movement, Soil and water management, Soil columns, Nitrate movement, Anion exclusion, Dispersion phosphorus, S/360 CSMP.

The objective was to determine, through the construction of a model, water and salt movement under unsaturated soil water conditions. This information would permit maintenance of a desired salinity level in soils and the reduction of pollution of groundwater supplies. Movement of salts and pesticides in lysimeters under unsaturated soil water conditions was investigated. In addition to computer models for predicting the simultaneous movement of water and nitrates or pesticides, a large amount of data on movement of salts and pesticides through soil columns is presented. In addition to data on total salts, data are presented on the movement of individual anions and cations since both the concentration and the ratio of the various ions in the drainage water need to be known for predictive purposes. These data provide much needed information on the behavior of these various ions during movement through a soil profile, and allow extensive testing of existing and future models on salt movement in a calcareous soil. (Creel-New Mexico)
W73-04552

THE DISCHARGE OF SUBMERGED BUOYANT JETS INTO WATER OF FINITE DEPTH,
General Dynamics Corp., Groton, Conn. Electric Boat Div.
R. F. Robideau.
Available from the National Technical Information Service as PB-214 475, $3.00 in paper copy, $0.95 in microfiche. Report No U440-72-121, November 1972. 86 p, 21 fig, 33 ref, 2 append. OWRR C-3336 (no 3717) (1).

Descriptors: *Jets, *Free surfaces, *Thermal pollution, *Temperature, Turbulent flow, Froude number, Buoyancy, Condensers, Path of pollutants.
Identifiers: Finite depth, Buoyant jet, Round jet, Plane jet.

A submerged, turbulent, buoyant jet discharging into water of finite depth is analyzed. The analysis is carried out for both a plane and round jet. The results predict the maximum surface temperature from such a discharge as a function of discharge angle, Froude number, and water depth. An integral approach is used in the analysis which entails making assumptions based on engineering judgement and known boundary conditions. Whenever possible, the assumptions are made in a conservative sense such that the actual surface temperature will be less than the predicted value. As such, the results are of use to the designer of a hot water diffuser system who must be sure that the maximum surface temperature does not exceed some specified amount.
W73-04554

BEHAVIOR OF WATER IN A SOUTHWESTERN IMPOUNDMENT,
Oklahoma Water Resources Research Inst., Stillwater.
E. H. Klehr.
Available from the National Technical Information Service as PB-214 478, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, 1972. 38 p 2 fig, 23 tab. OWRR A-013-OKLA (2), 14-31-0001-3836.

Descriptors: *Water quality, Physics, Percolation, *Oklahoma, *Model studies, Lakes, Water chemistry, Surface waters.
Identifiers: *Lake Thunderbird (Oklahoma), Norman Reservoir (Oklahoma).

This study of Lake Thunderbird considered the lake, its watershed and its effluent as an integral system. The 6,000 acre lake, closed in 1965, has a watershed of approximately 256 square miles. Surface water from intermittent streams is its only water supply. The lake was monitored for water quality at a number of measurement sites. Physical parameters studied were temperature, total dissolved solids, turbidity and pH. Some fifteen chemical parameters as well as bacterial and zooplankton analyses were considered. The contribution of the watershed-soil-rainwater to the quality of the lake water was studied both in situ and in a laboratory simulation which used watershed soil samples. In general, results from the first 250 days indicated that a column fed laboratory model of the lake could be established that was remarkably similar to the lake in terms of chemical water quality. Results further indicated that the column was capable of continually supplying biological and chemical constituents to the tank, thus allowing the model to be maintained over relatively long periods of time. It was therefore concluded that a laboratory simulation of an impoundment system as a study/predictive tool is possible.
W73-04559

BINDING AND PRECIPITATION OF TRACE ELEMENTS BY HUMIC SUBSTANCES IN NATURAL WATERS,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
J. M. Sieburth, and A. D. McNab.
Available from the National Technical Information Service as PB-214 481, $3.00 in paper copy, $0.95 in microfiche. Rhode Island Water Resources Center, Kingston, Termination Report, 1972. 24 p, 9 fig, 1 tab, 21 ref. OWRR A-034-R I (2), 14-31-0001-3240.

Descriptors: *Iron, *Lead, Sea water, *Trace elements, Water analysis, Freshwater, Color, Saline water, *Humus, Water pollution sources.
Identifiers: U.S. Intercoastal Waterway, *Humic substances.

Colored fresh waters entering the U.S. Intracoastal Waterway and the incursion of seawater at its many breachways yielded a spectrum of water colors and salinities in which to observe the influence of seawater on humic substances. There was good agreement between color of the water samples in platinum units, absorption at both 250 and 450 nm and the dissolved organic carbon content. Both the U.V. and visible absorbing materials decreased with increasing salinity to a much greater extent than that predicted by simple dilution. However, the curves for this decrease were similar when plotted against either salinity or the

suspended inorganic materials. Columns of nylon 6 powder adsorbed an average of 67% of the 450 nm absorbing material but only 30% of the 250 nm absorbing material. There was a tendency for the material absorbing onto nylon 6 to be associated with iron but not copper, lead or zinc. Iron appeared to originate in fresh water while lead appeared to be mainly associated with seawater.
W73-04562

CONCENTRATION OF PICLORAM IN RUNOFF WATER,
Agricultural Research Service, College Station, Tex.
J. R. Baur, R. W. Bovey, and M. G. Merkle.
Weed Science, Vol 20, No 4, p 309-313, July 1972, 3 fig, 1 tab, 16 ref.

Descriptors: *Water pollution sources, *Pollutants, *Herbicides, *Pesticides, *Water quality, Runoff water, Water pollution effects, Agricultural chemicals, Environmental effects, Mass transfer, Ion transport, Drainage water, Grasses, Plant tissues, Soil profiles, Rate of application, Time, Rainfall, Rainfall intensity, Experimental farms, Land management, Treatment, Safety, Cotton, Soybeans, Plant populations, Crop production, Texas.
Identifiers: *Picloram, Residues, Yaupon.

Agricultural chemical, which have environmental effects and may be transported by runoff and drainage, are used by farmers and ranchers to control a multitude of plant and insect pests. Picloram leaves residue in grass and yaupon tissue, and in soil profiles. Concentration of picloram in runoff is related to the rate applied, time between application and first rainfall, amount and intensity of rainfall, and watershed size. Picloram levels were monitored in runoff at varying distances from the 8-ha study site in east Texas over a 2 year period. Picloram application rate was 1.12 kg/ha in the spring of 1969 and 1970. Runoff was sampled adjacent to the plots and in 2 creeks up to 2.0 km from the plots. Samples adjacent to plots declined to less than 10 ppb by 10 to 12 weeks after application. Water sampled 1.2 km from plots contained less than 1 ppb of picloram eight days after application. Eight months after treatment, less than 1.0 ppb levels were occasionally detected 1.6 km from plots. It is unlikely that exposure of agronomic crops to water containing picloram at less than 1 ppb levels would be detrimental. Existing differential between runnoff concentrations and detrimental concentrations to cotton, soybean and sunflower species represents a margin of safety of 3 and 4 orders of magnitude (dicotyledonous and monocotyledonous species respectively). (Popkin-Arizona)
W73-04591

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS: I. RIVERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05C.
W73-04606

LARVAE OF DEEP-SEA FISHES (STOMIATOIDEA) FROM BISCAYNE BAY, FLORIDA, USA, AND THEIR ECOLOGICAL SIGNIFICANCE,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 02L.
W73-04608

GLOBAL CONCEPTS OF ENVIRONMENTAL CONTAMINATION,
California Univ., San Diego, La Jolla. Dept. of Chemistry.
J. N. Galloway.
Marine Pollution Bulletin, Vol 3, No 5, p 78-79, May 1972. 1 fig, 1 tab, 6 ref. S.C.C.W.R.P. 01259, NASA NGL 05-009-004.

Descriptors: *Copper, *Waste water, *Waste water disposal, *Pacific coast region, Environmental effects, Mining, Weathering.
Identifiers: *Los Angeles, *Global contamination, Mobilization processes, Trace metals.

The effects of ocean-dumping in the sea off Los Angeles, with respect to copper pollution, are investigated as a basis for assessment of the global input of this heavy metal to the ocean. An excess of copper in the ocean can be extremely dangerous to marine life. It is toxic at a level of 50 ppb. The natural rate of copper input (due to weathering and runoff) in seawater is in the range of 1-10 ppb; its concentration in waste water is of the order of 100-1,000 ppb. Various sources of man-mobilized copper input are discussed. These include mining processes, discarded scrap metal subject to the action of nature and the dumping of municipal waste water into the oceans. (Ensign-PAI)
W73-04609

DISPERSION ESTIMATES OFF NOBSKA POINT USING RECORDING CURRENT METERS,
Ontario Water Resources Commission, Toronto. Water Quality Surveys Branch.
M. D. Palmer, and J. B. Izatt.
Journal of the Boston Society of Civil Engineers, Vol 59, No 1, p 28-39, January 1972. 1 fig, 6 tab, 6 ref.

Descriptors: *Dispersion, *Current meters, *Waste dilution, *Sewage effluents, Sounds, Tides, Mixing, Forecasting, *Massachusetts, Sewage disposal.
Identifiers: *Nobska Point (Mass), *Sewage plumes, Dilution coefficients, Dispersion rates.

The effects a proposed domestic sewerage system on the waters off Nobska Point, Massachusetts were investigated. A current meter was used to provide estimates of the probable extent of the sewage plume and what dilution might be expected. The meter was operated for two weeks and the estimates were compared to estimates made by other methods. The 5 and 6 hour dilution rates for the ebb and flood tides range from 4690/1 to 8100/1, with the lower value occurring during the ebb tide. The current meter data indicated that initially dilution would take place more offshore than the other methods predicted. However, in order to correctly extrapolate current meter dilution predictions from a single fixed point to large areas required validation by other methods. Hourly dispersion rates were also predicted by the use of the current meter; these estimates were generally larger than estimates by other means and were considered more representative. (Ensign-PAI)
W73-04614

SCIENTIFIC AND TECHNICAL ASPECTS OF THE CONTROL OF COASTAL POLLUTION.
For primary bibliographic entry see Field 05G.
W73-04615

PESTICIDES IN THE LOWER ATMOSPHERE OF THE NORTHERN EQUATORIAL ATLANTIC OCEAN,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 05A.
W73-04617

PLAN FOR THE SOUTHERN NORTH SEA,
For primary bibliographic entry see Field 05G.
W73-04618

THERMAL DISCHARGES INTO THE COASTAL WATERS OF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, Los Angeles.
C-S. Young.
Report, October 1971. 30 p, 6 fig, 9 tab, 40 ref.

Descriptors: *California, *Coasts, *Thermal water, *Thermal pollution, *Waste water disposal, *Cooling water, Industrial wastes, Municipal wastes, Energy transfer, Surface waters, Temperature, Air-water interfaces.

An inventory of the present artificial thermal inputs into the coastal waters of Southern California was conducted. The relative significance of thermal waste as compared to the other effects of man on the marine environment was assessed. The inputs of cooling water, municipal wastewaters, and industrial wastewaters into the Southern California Coastal Waters, from the standpoint of energy flux, were evaluated. The energy transfer across the air-water interface was estimated and man-induced energy inputs were compared with natural inputs and then placed in perspective. An examination of the impact of thermal discharges on the surface temperature was also made. It has been concluded that it is technically and economically feasible to reduce the excess temperature in a waste heat plume to an ecologically desirable level by a properly engineered discharge structure. (Ensign-PAI)
W73-04619

ENVIRONMENTAL EFFECTS OF OIL POLLUTION IN CANADA, AN EVALUATION OF PROBLEMS AND RESEARCH NEEDS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-04620

MIXING MODEL PREDICTION OF FLUORIDE DISTRIBUTION IN CHESAPEAKE BAY,
Naval Research Lab., Washington, D.C.
T. B. Warner.
Journal of Geophysical Research, Vol 77, No 15, p 2728-2732, May 20, 1972. 1 fig, 18 ref.

Descriptors: *Chesapeake Bay, *Estuaries, Chemicals, *Mixing, Water analysis, Salinity, Freshwater, Water pollutants, Water pollution sources, *Fluorides, *Pollutant identification.
Identifiers: *Mixing models, Chemical distribution, Sinks.

The distribution of fluoride was measured in the Chesapeake Bay estuarine system from the Potomac River to the open ocean to establish how accurately fluoride concentrations could be predicted by assuming the simple mixing of ocean and river waters. Water samples were distributed over a wide area and gathered within as short a time as possible; total fluoride was determined with an LaF3 ion-selective electrode using a known-addition technique. The measured and predicted fluoride concentrations were compared; the mixing model predicted the distribution of fluoride within 2 to 3%, depending on the variability of input freshwater sources. It was concluded that a simple mixing hypothesis can very well predict fluoride levels in a moderately stratified drowned river-valley estuarine system. The method allows identification of non-conservative species and can be useful for quick identification of the probable direction toward, and magnitude of sources of conservative polluting substances. (Ensign-PAI)
W73-04621

ARTIFICIAL RADIOACTIVITY OF SOME HYDROBIONTS OF THE SOUTHERN OCEAN (SCOTIA SEA),
For primary bibliographic entry see Field 05C.
W73-04622

THEORY AND EXPERIMENTS IN THE PREDICTION OF SMALL WATERSHED RESPONSE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 02E.
W73-04625

EXPERIMENTS IN SMALL WATERSHED RESPONSE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 02E.
W73-04626

WATER QUALITY SIMULATION MODEL FOR THE UPPER WABASH RIVER,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. M. Bell.
Available from the National Technical Information Service as PB-214 591, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No. 34, 1973. 121 p, 2 fig, 34 tab, 144 ref, 2 append. OWRR A-013-IND (3).

Descriptors: Water quality control, *Model studies, *Reaeration, *Photosynthetic oxygen, *Dissolved oxygen, Biochemical oxygen demand, Oxygenation, Oxygen sag, *Simulation analysis, *Indiana.
Identifiers: *Wabash Basin (Ind), Deoxygenation.

The report represents a segment of a water resources systems analysis study for the Upper Wabash River Basin. Other aspects besides water quality simulation are reported in similar publications and include reservoir management, economics and political institutions. The basin studied involves an 8208 square mile area above Covington, Indiana. A significant conclusion was that with the present systems, a general predictive model from one basin to another cannot be used. A predictive model is proposed for the specific basin. The equation used considers the diurnal photosynthetic effect on the dissolved oxygen deficit. The correlation coefficient between observed DO profiles and those predicted by the model ranged between 0.8925 and 0.9779. Sensitivity studies indicated that for values of river BOD removal and reaeration coefficients determined from field observed data and for all flow and loading regimes, algae are a detriment to the maintenance of a minimum dissolved oxygen concentration. It was concluded that in spite of the assumptions and approximations used, the mathematical model developed does provide a basis for further field studies and a framework for additional sensitivity analyses from both a spatial and temporal aspect. (Wiersma-Indiana)
W73-04629

PROCEEDINGS OF THE NATIONAL GROUND WATER QUALITY SYMPOSIUM.
National Water Well Association, Columbus, Ohio.

Copy available from GPO Sup Doc as EP1.16: (16060GRB 08/71), $1.75; microfiche from NTIS as PB-214 614, $0.95. EPA report, cosponsored by the Environmental Protection Agency and the National Water Well Association, August 25-27, 1971, Denver, Colorado (1971). 211 p. EPA 16060 GRB 08/71. 68-01-0004.

Descriptors: *Groundwater movement, *Path of pollutants, *Conferences, *Water pollution, *Waste water disposal, Water quality, Water pollution sources, Waste disposal wells, Artificial recharge, Aquifer characteristics, Landfills, Waste disposal.

Contents include: EPS's role in groundwater protection; The contributions of C. E. Jacob to scientific hydrology and engineering works; Subsurface disposal of liquid industrial wastes in Alabama - A current status report; Subsurface storage and disposal in Illinois; Feasibility of recharging treated sewage effluent into a deep sandstone aquifer; Pesticide contamination of a shallow bored well in the southeastern coastal plains; Gasoline pollution of a ground-water reservoir - A case history; Petroleum contamination of ground water in Maryland; Ground-water pollution potential of a landfill above the water table; Groundwater pollution and sanitary landfills - a critical review; Effect of early day mining operations on present day water quality; Methods of geologic evaluation of pollution potential at mountain homesites; Nitrate in ground water of the Fresno-Clovis Metropolitan Area, California; The use, abuse and recovery of a glacial aquifer; A systems approach to management of the Hanford groundwater basin; Salty ground water and meteoric flushing of contaminated aquifers in West Virginia; and Probable impact of NTA on ground water. (See also W72-02075 through W72-02081.)
W73-04635

NERVE GAS-ISOPROPYL METHYLPHOSPHONOFLUORIDATE (GB)--DECOMPOSITION AND HYDROSTATIC PRESSURE ON THE OCEAN FLOOR,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
W. A. Adams.
Environmental Science and Technology, Vol 6, No 10, p 928, October 1972. 9 ref.

Descriptors: *High pressure, *Degradation (Decomposition), *Oceans, *Radioactive wastes, Injection wells, Radioactive waste disposal, Waste disposal wells, Waste disposal, Water pollution effects.
Identifiers: *Isopropyl methylphosphonofluoridate, *Nerve gas.

Previous calculations of the rate of decomposition of nerve gas disposed in the oceans have not considered the effects of increases in hydrostatic pressure. The half-life of hydrolysis of isopropyl methylphosphonofluoridate (GB) increases by approximately 25 percent at a depth of 4000 meters and 69 percent at 10,000 meters. Consequently, it is important to consider these effects with respect to disposal of toxic substances, including radioactive materials, in the sea or in deep wells since their fate is dependent on the high pressures in the environment. (Little-Battelle)
W73-04650

INHIBITION OF MITOCHONDRIAL ELECTRON TRANSPORT BY GUTHION, SOME RELATED INSECTICIDES, AND DEGRADATIVE PRODUCTS,
Nevada Univ., Reno. Div. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-04652

ALGAL POPULATIONS IN ARCTIC SEA ICE: AN INVESTIGATION OF HETEROTROPHY,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W73-04653

FATTY-ACID ECOLOGY OF A TIDAL MARSH,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries.
Limnology and Oceanography, Vol 17, No 3, p 433-440, May 1972. 2 fig, 2 tab, 16 ref.

Descriptors: *Tidal marshes, *Ecology, Chemical analysis, Salt marshes, Gas chromatography, Shrimp, Nutrients, Biodegradation, Marsh plants.
Identifiers: *Fatty acids, Spartina alterniflora, Spartina patens, Ruppia maritima, Fundulus majalis, Fundulus heteroclitus, Palaemonetes pugio, Thin layer chromatography, Macrophytes.

A study was made of the fatty-acid ecology of small tidal marsh, Bissel's Cove, located in Rhode Island. Samples of grasses, fish, and shrimp were collected and a quantitative estimation of fatty-acid methyl esters was obtained by either gas or thin-layer chromatography. A salt marsh has differing biochemical patterns: The grasses have a terrestrial pattern rich in 16-18 C fatty acids, the animals a marine pattern dominated by long-chain polyunsaturates. The patterns vary, but they remain far more distinct than at corresponding positions in the structure of an offshore community. Each pattern is reflected in the diet of two species of marsh fishes. Their most probable diet is a mixture of 5 parts detritus to 1 part marine invertebrates. This ratio is also a boundary condition; it cannot go any higher and still account for the patterns occurring in the digestive tracts. Food is so abundant during spring that despite identical diets the two species could avoid competition. (Byrd-Battelle)
W73-04655

UNDERESTIMATION OF STANDING CROP BY THE SURBER SAMPLER,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 07B.
W73-04656

GROWTH INTERACTIONS BETWEEN CHLAMYDOMONAS GLOBOSA SNOW AND CHLOROCOCCUM ELLIPSOIDEUM DEASON AND BOLD: THE ROLE OF EXTRACELLULAR PRODUCTS,
Nijmegen Univ. (Netherlands). Botany Lab.
For primary bibliographic entry see Field 05C.
W73-04657

DISTRIBUTION OR ORGANIC CARBON IN A GLACIAL ESTUARY IN ALASKA,
Alaska Univ., College. Inst. of Marine Science.
T. C. Loder, and D. W. Hood.
Limnology and Oceanography, Vol 17, No 3, p 349-355, May 1972. 1 fig, 5 tab, 15 ref.

Descriptors: *Estuaries, *Spatial distribution, Chemical analysis, *Alaska, Adsorption, Sea water, Water sampling, Brackish water, Infrared radiation, Oxidation, Filtration, Pollutant identification, Eutrophication.
Identifiers: *Organic carbon, *Glacial water, *Particulate organic matter, *Dissolved organic matter, Particulate organic carbon, Dissolved organic carbon, Particulate nitrogen, North Dawes River, Glacial clays, Infrared analysis, Wet oxidation method, Nitrogen anaiyzer, Sample preparation.

The distribution is described of organic carbon in a glacial estuary in Alaska. North Dawes Inlet was sampled for particulate organic carbon (POC), dissolved organic carbon (DOC), particulate nitrogen (PN), and total particulate matter (PM). POC was determined by infrared analysis, DOC by a wet oxidation method, PN by using a nitrogen analyzer, and PM by filtration. The POC in glacial runoff ranged from 0.24-1.24 mg/liter and DOC varied from 0.15-0.53 depending on the season and amount of local rainfall. Inlet waters ranged from 0.035-0.65 mg/liter of POC and 0.65-1.6 of DOC. Values of POC, PN, and PM decreased with depth in the top 20 m of the inlet and with distance from the mouth of the river. About half of the POC was deposited in the inlet; the remainder was carried out in suspension. During summer a biologically active layer just beneath the freshwater lens was characterized by high POC and DOC, low C:N ratios, and low PM. Adsorption or release of organic compounds by the glacial clays was not detected. (Byrd-Battelle)
W73-04658

RADIOECOLOGICAL INVESTIGATIONS IN A THERMAL SPRING REGION,
Zagreb Univ. (Yugoslavia). Faculty of Sciences.
G. Lovric, and P. Strohal.
Limnology and Oceanography, Vol 17, No 3, p 441-444, May 1972. 3 tab, 9 ref.

Descriptors: *Radioecology, *Thermal springs, *Water analysis, *Soil analysis, Path of pollutants, Radioactivity, Lead radioisotopes, Radium radioisotopes, Spring waters, Water pollution, Pollutant identification, Biota, Mud, Aquatic soils, Absorption, Physiochemical properties, Snails, Water sampling, Oxygen, Carbon dioxide, Water temperature.
Identifiers: Bioaccumulation, Radon radioisotopes, Gamma ray spectrometry, Oscillatoria princeps, Potamogeton fluitans, Ludwigia palustris, Bismuth radioisotopes, Amphimelania holandri, Hemisinus acicularis, Radix peregra, Cladophora glomerata, Spirogyra rivularis, Spirogyra irregularis, Theodoxus danubialis, Pa-234, Ra-226, Rn-222, Pb-214, Bi-214, Biocenosis, Nitella.

The possible accumulation of naturally occurring radioisotopes in aquatic organisms and sediments of a radioactive thermal spring area is investigated. Samples were collected over a period of two years with a benthos net, and radioactivities in water, plants, animals, and sediments due to lead, radium, protactinium, radon and bismuth radioisotopes were measured by means of gamma ray spectrometry. The data indicate that organisms living in the thermal spring area accumulate the radioisotopes investigated. Some of the radioisotopes are probably present in the biota only as daughter products of long-lived radioisotopes due to several radioactive equilibria. Most of the activities are alpha-emitting radioisotopes which produce intensive specific ionization. The level of radioactivity measured suggests the possibility of investigating the influence of small doses of radiation on biocenoses, since such conditions have existed for centuries. (Byrd-Battelle)
W73-04659

DATA ON THE COMPOSITION AND DARK SURVIVAL OF FOUR SEA-ICE MICROALGAE,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
J. S. Bunt, and C. C. Lee.
Limnology and Oceanography, Vol 17, No 3, p 458-461, May 1972. 3 tab, 14 ref.

Descriptors: *Marine algae, *Sea ice, *Photoperiodism, Carbon, Cultures, Antarctic Ocean, Growth rates, Organic matter, Nutrients, Chrysophyta, Plant pigments, Limiting factors, Pollutant identification.
Identifiers: Chlorophyll a, Phase contrast microscopy, Survival, Carotenoids, Flagellates, Fragilaria sublinearis, Chaetoceros fragile, Substrates, Acetates, Pyruvates, Glycolate, Succinates, Citrates, Lactates, Glycine.

Changes in cell numbers, Carbon and pigment content of four species of microalgae isolated from antarctic sea ice were followed over a period of 6 months, the first 3 in the light and the last 3 in complete darkness. Cell carbon and pigments were determined by standard techniques, and cell counts using phase contrast microscopy. With one exception, all organisms retained their viability throughout even though the medium was not supplemented with organic substances capable of serving as nutrients. In another series of experiments, growth responses to organic supplements were variable and pigment composition was also affected. (Byrd-Battelle)
W73-04664

RESIDUES OF DDT AND ITS DEGRADATION PRODUCTS IN COD LIVER FROM TWO NORWEGIAN FJORDS,
Statens Plantevern, Vollebekk (Norway).
For primary bibliographic entry see Field 05C.
W73-04669

CHROMOUS CHLORIDE REDUCTION. VII. STEREOCHEMISTRY AND STRUCTURE OF THE MAJOR PRODUCT EMPLOYED IN THE CONFIRMATION OF ENDRIN RESIDUES,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
A. S. Y. Chau, and R. J. Wilkinson.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 105-108, August 1972. 1 fig, 10 ref.

Descriptors: *Endrin, *Pesticide residues, Reduction (Chemical), Chemical reactions, Pollutant identification, Nuclear magnetic resonance, Chlorinated hydrocarbon pesticides.
Identifiers: Infrared absorption, Stereochemistry, Chemical structure, Chromous chloride.

Reaction of chromous acetate with endrin produced a minor product similar to that produced in reactions of chromous chloride and endrin. The stereochemistry of the product, pentachloroketone (II), was confirmed by chemical means in the present investigation. The IR and NMR spectra were identical to those of pentachloroketone (II) obtained from chromous chloride or chromous acetate reaction with endrin. The structure of endrin derivatives and the reaction pathway are shown. (Little-Battelle)
W73-04671

CORRECTION FOR LAG IN CONTINUOUS-FLOW RESPIROMETRY,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-04676

DYNAMICS OF ORGANIC COMPOUNDS OF NITROGEN AND PHOSPHORUS AS AN INDEX OF BIOTIC CYCLE OF SUBSTANCES IN LAKE BAIKAL (IN RUSSIAN),
E. N. Tarasova, and K. K. Votintsev.
Gidrobiol Zh. Vol 7, No 6, p 5-12. 1971. Illus. English summary.
Identifiers: Biotic cycles, Dynamics, Index, *Lake Baikal, *Nitrogen, Organic compounds, *Phosphorous, Phytoplankton, USSR.

Content, vertical distribution and seasonal dynamics of organic N and P were considered in water mass of Lake Baikal. For all water mass of the lake, organic N amounts at an average in a year to 43% of total compounds, organic P to 23%. With depth, the content of N and P decreases. At the bottom (1400 m) it accounts for about 30% of the corresponding values on the surface. Ratio of organic C to organic N changes from 8.6 on the surface to 21.3 on the bottom, that of organic C to organic P from 130.6-270.3, respectively. A direct dependence is established between the contents of organic compounds of N and P on the values of phytoplankton primary production.--Copyright 1972, Biological Abstracts, Inc.
W73-04677

AMINE-CITRATE BUFFERS FOR PH CONTROL IN STARCH GEL ELECTROPHORESIS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. W. Clayton, and D. N. Tretiak.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1169-1172, August 1972. 4 fig, 1 tab, 18 ref.

Descriptors: *Hydrogen ion concentration, Enzymes, Pollutant identification, Bioassay, Proteins, Biochemistry, Kinetics, Fish, Methodology, Water pollution effects.
Identifiers: *Amine-citrate buffers, Amines, *Starch gel electrophoresis, Dehydrogenase, Isozymes, Malate dehydrogenase, Lactate, Dehydrogenase coregonus clupeaformis, Stizostedion vitreum, Sample preparation, N- (3-aminopropyl)-morpholine, N- (3-aminopropyl)-diethanolamine, 1 3-bis (dimethylamino-2-propanol), N N-bis (2-hydroxyethyl)iminotris (hydroxymethyl)methane, tris- (hydroxymethyl)-methylamine.

This investigation illustrates the good resolution of the multiple isozymes of some fish dehydrogenases that is produced in starch gel electrophoresis when the gel pH is controlled by amine-citrate buffer systems. These systems produce eletrophoretic separations that may be interpreted directly in terms of the pH of the medium and are not influenced by the character of any particular buffer species. Three previously unused amines together with Tris and bis-Tris provide a series of amine buffers with pK's at 0.5 pH unit intervals in the pH range 6.1-8.1. The observed differences in the buffering capacity of the electrophoresis buffers did not seem to affect the quality of the electropherograms. The ionization of all the amines tested was, as expected, markedly temperature-dependent, and reproducible electropherograms are likely to depend upon adequate temperature control during both buffer preparation and electrophoresis. (Holoman-Battelle)
W73-04678

VOLATILE COMPOUNDS PRODUCED IN GROUND MUSCLE TISSUE OF CANARY ROCKFISH (SEBASTES PINNIGER) STORED ON ICE,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05A.
W73-04680

STREAM POLLUTION FROM ANIMAL PRODUCTION UNITS,
Louisiana Tech. Univ., Ruston.
J. W. D. Robbins, D. H. Howells, and G. J. Kriz.
Journal Water Pollution Control Federation, Vol 44, No 8, p 1536-1544, August 1972. 5 fig, 4 tab, 8 ref. EPA 13020 DGX.

Descriptors: *Water pollution sources, *Water quality control, *Farm wastes, *Agricultural runoff, Streams, Coliforms, Regression analysis, Water quality, Lagoons, Watersheds, Rainfall, Streamflow, Streptococcus, Biochemical oxygen demand, Organic wastes, Nitrogen, Nitrates, Phosphates, Conductivity, Hydrogen ion concentration, Pollutant identification, Membrane processes, Solid wastes, Phosphorus, Ammonia, Nutrients, Eutrophication, Groundwater, Sampling, Carbon, Nitrites, Enteric bacteria, Physicochemical properties.
Identifiers: Standard methods, Sample preservation, *Pollution index, Kjeldahl nitrogen, Orthophosphates.

The results of a 2-year study to investigate the actual and potential importance of animal wastes in agricultural land runoff indicates that stream quality surveys could be limited to analysis of a few key indexes, with the remainder being estimated. Data were collected at 12 study sites on waste lagoons, direct discharge operations, and watersheds to determine the amount and strength of raw waste and waste that reached the streams under varying conditions of rainfall, runoff, and temperature. Automatic samplers were developed for the study. Samples were tested for total and fecal coliforms, fecal streptococci, BOD, COD, total solids, volatile solids, total organic carbon, Kjeldahl nitrogen, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total phosphate, orthophosphates, specific conductivity, and pH. Regression analysis was used to evaluate results and revealed high correlation among many of the pollution indexes. Testing for total organic carbon was particularly promising as an index that could

be used in estimating others. It was concluded that the extent of water pollution caused by farm animal production is almost entirely dependent on the production and waste-management practices utilized rather than on the volume of wastes involved. (Mortland-Battelle)
W73-04696

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W73-04700

CADMIUM UPTAKE BY MARINE ORGANISMS,
National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 05C.
W73-04702

BUNKER C OIL IN SEDIMENTS AND BENTHIC ANIMALS FROM SHALLOW DEPTHS IN CHEDABUCTO BAY, N.S.,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. J. Scarratt, and V. Zitko.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1347-1350, September 1972. 1 fig, 3 tab, 4 ref.

Descriptors: *Benthic fauna, *Sediments, *Oil spills, *Shallow water, *Path of pollutants, *Soil analysis, Oil pollution, Herbivores, Carnivores, Omnivores, Metabolism, Chemical analysis, Food chains, Bottom sampling, Crabs, Mussels, Lobsters, Water pollution effects, Bioassay, Aquatic soils, Absorption, Littoral.
Identifiers: *Bunker C oil, Starfish, Sea urchins, Periwinkles, Fuel oil, Assimilation, Macroinvertebrates, Biological magnification, Sublittoral, Ultraviolet spectrophotometry, Littorina littorea, Modiolus modiolus, Strongylocentrotus droebachiensis, Asterias vulgaris, Cancer irroratus, Homarius americanus, *Chedabucto Bay (NS).

A survey is presented of the distribution and possible effects of Bunker C fuel oil on sublittoral biota in Chedabucto Bay 26 months after the wreck of the tanker 'Arrow'. Sediment samples were collected and the concentration of Bunker C oil determined by U.V. spectrophotometry, while the oil content of whole animals or separate organs was determined by standard techniques. Soft sediments showed considerable fluctuations in Bunker C oil content but little evidence of diminution of Bunker C concentration following the wreck. Coarse sediment samples and most benthic species showed maximum oil concentrations about 1 year after the wreck and some reduction since then. Herbivorous or browsing species had higher oil content than carnivorous or omnivorous species. There is evidence from fluorescence emission spectra that some carnivorous or omnivorous species are able to assimilate and partly metabolize Bunker C oil, but no evidence that Bunker C or its fluorescent derivatives and fractions were being concentrated in higher parts of the food chain. (Byrd-Battelle)
W73-04703

STREAM ECOSYSTEM: ORGANIC ENERGY BUDGET,
Amherst Coll., Mass. Dept. of Biology.
S. G. Fisher, and G. E. Likens.
Bioscience. Vol 22, No 1, p 33-35. 1972. Illus.
Identifiers: *Ecosystems, *Energy budget, *Organic matter, Stream pollution sources.

An attempt is made to determine the complete annual organic matter budget of a small stream ecosystem by monitoring inputs and outputs of energy in a 1700 m section of Bear Brook, a small 2nd order stream in the Hubbarb Brook Experimental Forest, West Thornton, New Hampshire.--Copyright 1972, Biological Abstracts, Inc.
W73-04714

THE OXIDATION OF IRON SULPHIDES IN SOILS IN RELATION TO THE FORMATION OF ACID SULPHATE SOILS, AND OF OCHRE DEPOSITS IN FIELD DRAINS,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 02G.
W73-04716

A COMPARISON OF CHEMICAL, ISOTOPIC, AND ENZYMATIC METHODS FOR MEASURING NITROGEN ASSIMILATION OF MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. J. McCarthy, and R. W. Eppley.
Limnology and Oceanography, Vol 17, No 3, p 371-382, May 1972. 3 fig, 3 tab, 29 ref.

Descriptors: *Nitrogen, *Phytoplankton, *Cultures, *Sea water, *Measurement, *Reduction (Chemical), *Methodology, Chemical analysis, Radiochemical analysis, Nutrients, Nitrates, Ammonium salts, Ureas, Enzymes, Nitrites, Absorption, Radioactivity techniques, Nitrogen compounds, Marine algae, Marine biology, Assay, Water sampling, Diatoms.
Identifiers: *Assimilation, Enrichment, Particulate nitrogen, Shipboard measurements, Enzymatic inhibitors, Culturing techniques, N-15, Reductase, Chlorophyll a, ATP, Dehydrogenase, NADH, NADPH, Leptocylindrus danicus, Nitzschia spp, Chaetoceros spp, Hemiaulissinensis, Skeletonema costatum, Asterionella japonica, Nitrogen radioisotopes.

Shipboard cultures of natural seawater enriched with nitrate, ammonium, or urea were used to compare different techniques for measuring nitrogen assimilation by phytoplankton and to measure the rates of uptake of these nutrients when more than one was present. Increases in particulate nitrogen, decreases of nitrogenous nutrients, and the uptake by phytoplankton (using the N-15 isotope technique) balanced rather well and for the nitrate-enriched culture were in good agreement with the estimate of nitrogen assimilation from nitrite reductase activity. Glutamic dehydrogenase activity was present with both NADH and NADPH in all three cultures; either singly or as a sum it agreed poorly with ammonium uptake estimated by the N-15 isotope technique. The presence of ammonium almost totally suppressed the uptake of nitrate and urea over a wide range of concentrations. The suppression of nitrate uptake in the presence of urea was nearly the same as the suppression of urea uptake in the presence of nitrate. Comparisons between the isotopic and enzymatic techniques were also made in seawater samples. Nitrite reductase activity was usually much greater than the rate of nitrate uptake estimated by the N-15 isotope technique. Comparisons with chlorophyll a and ATP analysis indicate that chlorophyll-containing cells were primarily responsible for the nitrite reductase activity. The rate of pyridine nucleotide oxidation with both NADH and NADPH was more consistent with the ATP than with the chlorophyll a content of seawater samples, suggesting that this enzymatic activity was not restricted to the phytoplankton. (Holoman-Battelle)
W73-04719

BIOCHEMICAL OXIDATION OF VOLATILE ORGANIC ACIDS BY ACTIVATED SLUDGE,
Gifu Coll. of Pharmacy (Japan). Dept. of Environmental Hygiene.
T. Sato, and T. Akiyama.
Water Research, Vol 6, No 9, p 1059-1072, September 1972. 4 fig, 7 tab, 21 ref.

Descriptors: *Biochemical oxygen demand, *Biodegradation, *Activated sludge, *Organic acids, *Salts, Biochemistry, Bioassay, Absorption, Respiration, Water pollution effects, Organic wastes, Waste water treatment.
Identifiers: *Warburg respirometer, Formates, Acetates, Propionates, Butyrates, Valerates, Caproates, Substrate utilization, Formic acid, Acetic acid, Propionic acid, Butyric acid, Valeric acid, Caproic acid.

Biochemical oxidation of the sodium salts of formic, acetic, propionic, butyric, valeric, and caproic acids by activated sludge was investigated using Warburg manometers. A series of experiments were conducted to determine the relation between sludge concentration and uptake rate; oxygen uptake using various acetates as substrates; the effect of substrate concentration; the percentage oxidation, and oxygen uptake rates and substrate removal rates with volatile acid salts; the change in oxygen uptake rates with volatile acid salts; oxygen uptake with simultaneous addition of formate and acetate; oxygen uptake and substrate removal; and respiratory quotient (RQ). The conclusions were: (1) The oxygen uptake of activated sludge was proportional to the sludge concentration with endogenous respiration as well as after the addition of substrate. (2) No difference was observed among the oxygen uptake of sodium, potassium, calcium and ammonium salts of acetic acid. (3) The volatile acid salts were utilized by activated sludge, but inhibition was observed at high substrate concentrations. (4) The percent oxidation of formate was higher than those of other acid salts. (5) The oxygen uptake rate of activated sludge in a state of endogenous respiration and in the presence of formate decreased with time but increased with other acid salts. (6) When formate and acetate were added simultaneously, no interaction between them was observed. (7) When acetate was added to activated sludge, adsorption occurred initially followed by approximately linear increases in substrate removal and oxygen uptake. (8) The RQ values of endogenous respiration, acetate, formate and skim milk were respectively 0.9, 1.13, 1.61 and 1.00. (Little-Battelle)
W73-04722

ROLE OF FRESHWATER VEGETATION IN MIGRATION AND DISTRIBUTION PROCESSES OF NATURAL RADIOACTIVE ELEMENTS IN A WATER BASIN,
A. A. Iskra, N. V. Kulikov, and V. G. Bakhurov.
Ekologiya. Vol 1, No 2, p 83-89. 1970. Illus.
Identifiers: *Aquatic plants, Distribution, Elodea canadensis M, Freshwater, Migration, Myriophyllum spicatum D, Processes, *Radioactive elements, Vegetation, Watersheds (Basins).

Accumulation of U-238, Ra-226 and Th-232 by 27 spp. of freshwater plants (14 higher, 5 multicellular, and 8 unicellular) was studied. Experiments were carried out in duplicate in 10 l containers filled with lake water of hydrocarbonate-Ca-Mg type. U and Th were introduced as nitrates and Ra as a chloride. Initial concentration of U and Th was 1 mg/l, of Ra 2.10-9Ci/l. In model systems consisting of water and plants only, U remained mostly in water and plants assimilated, on the average, 24.2, 6.3 and 10.0% from the initial amount of radioactive elements. Some plants stood out with unusually high coefficients of accumulation for each element. Th differs from U considerably in that most of it concentrated in the dextritus and plants, and only 2.4-4.2% remained in the water; unicellular plants assimilated up to 78% Th. Ra distributed rather evenly; in water remained 26.3 to 57.3%. Most complete purification of water from radioactive elements took place in a water-bottom soil-plant system. In this closed system 6 l of water was used and 0.8 kg of mud covered with 1.2 kg layer of lake sand was used as bottom soil. Live Elodea canadensis, and Myriophyllum spicatum were placed in the basin. Here U accumulated predominantly in plants, Th in detritus and bottom soil, and Ra distributed

again more or less evenly between the 3 components of the system.--Copyright 1972, Biological Abstracts, Inc.
W73-04725

STABILITY OF ELEMENTAL PHOSPHORUS IN EDIBLE MUSCLE TISSUE OF COD DURING PROCESSING INCLUDING ICING, FREEZING AND THAWING, FROZEN STORAGE, SALTING, AND COOKING,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
W. J. Dyer, D. F. Hiltz, R. G. Ackman, J. Hingley, and G. L. Fletcher.
Journal Fisheries Research Board of Canada, Vol 29, No 7, p 1053-1060, 1972. 4 fig, 4 tab, 8 ref.

Descriptors: *Phosphorus, *Separation techniques, *Sampling, Fish, Commercial fish, Food processing industry, Sea water, Freezing, Public health, Water pollution effects.
Identifiers: *Atlantic Cod, Godus morhua, Placentia Bay, Methanol, Isooctane, Homogenation, Cooking, Pickling, Food storage, Biological samples, Sample preparation.

Atlantic Cod (Gadus morhua) were exposed in vivo to elemental phosphorus in a sea water filled laboratory aquarium for later use in determining phosphorus stability during processing of the fish by procedures simulating commercial methods. Samples were taken by excising several cores with a cork borer, 1.1 or 1.5 cm in diameter, from the thicker parts of the white muscle of the round fish or the fillets. An extraction method for elemental phosphorus from cooked fish was modified as follows: methanol and isooctane were added to the sample, then the mixture was homogenized, ice cooled, filtered, and the isooctane layer seperated. After iced storage, freezing and thawing, frozen storage, or cooking, from 40 to 100 percent of the original phosphorus remained. In pickle - and in kench-salted cod, 25 percent or more of the phosphorus remained after 1-1/2 to 2 months. The rate of decrease of elemental phosphorus was more rapid during iced or frozen storage
W73-04730

RADIOISOTOPE TRACING OF OIL REFINERY WASTEWATER DILUTION,
Shell Development Co., Emeryville, Calif.
H. Siegel, A. Telfer, and E. L. Bastin.
Journal Water Pollution Control Federation, Vol 44, No 8, p 1637-1642, August 1972. 4 fig, 2 tab, 2 ref.

Descriptors: *Oil wastes, *Waste dilution, *Tracers, Bromides, Aqueous solutions, Water quality standards, Oil industry, Fluorescent dyes, Estuaries, Velocity, Tides, Profiles, Spectrometers, Model studies, Mathematical models, Hydrodynamics.
Identifiers: *Potassium bromide, *Br-82, Bromine radioisotopes, Scintillation detector.

An aqueous solution of potassium bromide (Br-82) was used as a radioisotope tracer to determine if initial dilution of an oil refinery wastewater discharged through a subsurface diffuser into a tidal estuary met Water Quality Control Board specifications. Initial tests with fluorescent dyes indicated that the dilutions were proportional to tidal current velocity. Field tests were made both at flood and ebb tides using submerged scintillation detectors to measure Br-82 concentration. The tidal velocities were measured at three points near the diffuser. The dilution of the wastewater in the receiving water was determined by measuring the Br-82 concentration in the effluent pipe and comparing concentrations at the points where the tidal velocity was also measured as a function of time and depth. The resulting dilutions were plotted as vertical dilution profiles. A simple hydrodynamic model was determined from these field test results. Maximum dilution is obtained when a constant dilution is maintained throughout the discharge period. (Pestel-Battelle)
W73-04733

MOBILIZATION OF MERCURY FROM SEDIMENTS INTO GUPPIES (POECILLIA RETICULATA),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. C. Gillespie.
Journal of the Fisheries Research Board of Canada, Vol 29, No 7, p 1035-1041, July 1972. 3 fig, 3 tab, 14 ref.

Descriptors: *Mercury, Biology, *Sediments, Absorption, Heavy metals, Chlorides, Sulfides, *Aerobic conditions, *Anaerobic conditions, Pollutant identification, Water pollution sources, Freshwater fish, Bioindicators, Path of pollutants.
Identifiers: *Guppies, *Mobilization, Lignosulfhonate, Biotransformation, Methylation, Poecilia reticulata, Methyl mercury, Mercury chloride, Mercury compounds, Mercury sulfhide, Flameless atomic absorption, St. Clair River, Atomic absorption spectrophotometry, Saskatchewan River, Fate of pollutants.

Guppies (P. reticulata) were exposed in aquaria to aerobic and anaerobic sediments to which various forms of mercury were added and to sediments from two sites of industrial pollution. Whole body levels of total mercury (atomic absorption analysis) in these fish were used as a measure of mobilization of mercury from these sediments. Spot checks for methylmercury were carried out at intervals during the tests. Under aerobic conditions there was little mobilization of mercury from sediments to which mercuric chloride or sulphide had been added but total mercury concentrations rose rapidly in fish exposed to sediments containing metallic mercury. The proportion of methylmercury in fish reached maxima of 30 percent for metallic mercury, 40 percent for mercuric chloride, and 45 percent for mercuric sulphide. In anaerobic sediments, total mobilization was low and only mercuric chloride was significantly methylated. Both mobilization and methylation were proportionately greater in industrial sediments with a low mercury content than in sediments with a higher mercury content, enrichment of sediments with lignosulphonate showed no real effects aerobically; however, anerobically, it stimulated methylation of mercury. (Long-Battelle)
W73-04736

LOCAL SCOUR AND SCOURING EFFECTS ON SEWER OUTFALLS,
Lund Inst. of Tech. (Sweden).
For primary bibliographic entry see Field 08B.
W73-04778

WATER QUALITY CONDITIONS IN THE CHESAPEAKE BAY SYSTEM,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05A.
W73-04784

MANGANESE IN LACUSTRINE ECOSYSTEMS: A REVIEW,
State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences.
W. B. Kirchner, and S. Grabowski.
Water Resources Bulletin, Vol 8, No 6, p 1259-1264, December 1972. 74 ref.

Descriptors: *Manganese, *Water chemistry, *Lakes, Limnology, Nutrients, Trace elements, Oxidation-reduction potential, Ecosystems, Water analysis, Sedimentation, Chemical precipitation.

The literature of manganese in fresh water is reviewed. The major aspects of manganese occurrence discussed are: (1) sources, (2) geochemistry, (3) manganese-iron relationships, (4) effects on the fauna and flora and (5) detection. There are three major ways that manganese enters natural waters. The basin's rocks may release manganese into solution by weathering. Industrial dumping is another pathway. Drainage from litter and soil is a lesser source. The chemical behavior of Mn is strongly affected both by oxidation-reduction potential and by pH. Solubility can also be influenced by biological activity. Manganese is found next to iron in the periodic table and both have similar chemical characteristics. Dissolved manganese occurs at a somewhat higher level in the oxygen gradient than iron. Consequently manganese ions are at too high redox potentials to permit the presence of detectable ferrous ions. As a result the manganous ion travels farther from the sediment than does the ferrous ion. Ferro-manganese complexes and formations are coprecipitated on the bottom of streams and lakes. Manganese oxides in bottom sediments occur in two forms: Crusts or coatings and as nodules. Manganese is a vital trace element essential to bacteria, yeast, fungi, plants and animals. Manganese can have an indirect role on nutrient availability in fresh water. The detection of manganese is easily performed and sensitivity is extremely good. (Knapp-USGS)
W73-04787

WATER POLLUTION AS AFFECTED BY STREET SALTING,
State Univ. of New York, Syracuse. Water Resources Center.
R. H. Hawkins, and J. H. Judd.
Water Resources Bulletin, Vol 8, No 6, p 1246-1252, December 1972. 1 fig, 3 tab, 12 ref.

Descriptors: Water pollution sources, *Deicers, *Salts, *Snow removal, *New York, *Path of pollutants, Urban hydrology, Suburban areas, Roads, Highway icing, Stratification, Density stratification, Salinity, Environmental effects, Water pollution sources.
Identifiers: *Street salting, Road salting, Meadowbrook (NY), Syracuse (NY).

The use of salt to melt ice and snow on streets and roads has become prevalent throughout the Northeast U.S. Several states apply as much as 20 tons per lane-mile. Eventually the salt reaches streams and lakes. In Meadowbrook, New York, the chloride content reached a high of 11,000 ppm in December 1969. The runoff from the watershed was emitted in several surges. Chloride concentrations declined with the onset of summer, but still remained high, suggesting that some of the salt applied during the past winter appeared in the summer streamflow. Salt runoff entered a small lake, and flowed directly to the lake bottom. The buildup of high density saline water in the lower portion of the lake prevented complete mixing in the spring. Incomplete mixing led to anoxic conditions in the lower lake strata. The population of benthic fauna of the lake was changed by the flow of salt water into the lake. From a total of 10 species of dipteran larva and oligochaetes, only 4 species remained. (Knapp-USGS)
W73-04789

THERMOMAGNETIC BEHAVIOR OF MANGANESE NODULES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W73-04801

PRODUCTION OF CARBON MONOXIDE IN RAIN WATER,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 02K.
W73-04802

DEMONSTRATION OF RHODANESE ACTIVITY IN POLYACRYLAMIDE GELS,
Connecticut Univ. Health Center, Hartford.
For primary bibliographic entry see Field 05A.
W73-04818

PRELIMINARY RESEARCH ON THE LIPOLYTIC BACTERIAL PSYCHROPHILES OF SOIL AND WATER, (RECHERCHES PRELIMINAIRES SUR LES BACTERIES LIPOLYTIQUES PSYCHROPHILES DES SOLS ET DES EAUX),
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-04838

DEVELOPMENT OF A MATHEMATICAL MODEL TO PREDICT THE ROLE OF SURFACE RUNOFF AND GROUNDWATER FLOW IN OVERFERTILIZATION OF SURFACE WATERS,
Minnesota Univ., Minneapolis.
J. D. Johnson.
Available from Univ. Microfilms, 300 N. Zeeb Rd Ann Arbor, Mich. Order No. 72-361. PhD Dissertation, 1971. 284 p.

Descriptors: *Mathematical models, *Surface runoff, *Base flow, *Forecasting, Eutrophication, *Surface waters, Mathematical studies, Equations, Watersheds, Nutrients, Nitrogen, Phosphorus, Pollutant identification, Automation, Minnesota, Instrumentation, Precipitation (Atmospheric), Feed lots, Municipal wastes, Industrial wastes, Effluents, Septic tanks, Water sampling, Sewage effluents, Water pollution sources, Water quality control.

Automatic pump samplers were used to collect over 800 water samples from a watershed and a city drainage channel for identification and quantification of various sources of the nutrients N and P. The water samples were analyzed for four components of N, total and soluble P, and four components of solids. Streamflow was determined at the time of sampling. These data were used to develop a mathematical model of surface runoff and groundwater flow as factors in overfertilization of surface waters. The model included nutrient sources from precipitation, feedlots, municipal sewage treatment effluent, industrial effluent, septic tank effluents, forest and wildland runoff, and a conglomerate of surface runoff and groundwater flow. The results of regression on streamflow were utilized to obtain an equation for the base flow. Such information is essential for development of effective control techniques. (Mackan-Battelle)
W73-04839

CHEMICAL ENRICHMENT AND EXCLUSION WITH ION EXCHANGE MEMBRANES,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04843

KINETIC BEHAVIOR OF ENZYMES IMMOBILIZED IN ARTIFICIAL MEMBRANES,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04846

DIFFERENTIATION BETWEEN PSEUDOMONAS TESTOSTERONI AND P. ACIDOVORANS BY GAS CHROMATOGRAPHY,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 05A.
W73-04853

PESTICIDES AND HEAVY METALS IN THE AQUATIC ENVIRONMENT,
Iowa Univ., Iowa City. State Hygienic Lab.
R. L. Morris, L. G. Johnson, and D. W. Ebert.
Health Lab Sci. Vol 9, No 2, p 145-151. 1972.
Identifiers: *Path of pollutants, Aldrin, Dieldrin, Environment, Soil erosion, Fish, *Heavy metals, Iowa, *Pesticides, Soils.

Aldrin applied to row crops in Iowa is appearing as high levels of dieldrin in edible tissue of catfish but not in par or predator fish. Research indicates that bottom silts and associated food chain organisms aggregate these pesticides carrying over from 1 yr application period to another. Correlation between high turbidity or soil erosion and elevated muscle tissue dieldrin concentration indicates the necessity of improved soil conservation practices. Methodology and concentrations of heavy metals in the water, bottom silts and aquatic organisms are presented. Selective fish species concentration of mercury contrasted to pesticide aggregation is discussed.–Copyright 1972, Biological Abstracts, Inc.
W73-04854

THE EFFECT OF CARBON DIOXIDE AND PARTICLE SURFACE AREA ON THE MICROBIOLOGICAL LEACHING OF A ZINC SULFIDE CONCENTRATE,
Department of Natural Resources, Quebec.
A. E. Torma, C. C. Walden, DL. W. Duncan, and R. M. R. Branion.
Biotechnology and Bioengineering, Vol 14, No 5, p 777-786, September 1972. 3 fig, 1 tab, 33 ref.

Descriptors: *Carbon dioxide, *Particle size, *Leaching, *Environmental effects, Free surfaces, Particle shape, Limiting factors, Thiobacillus ferrooxidans, Sulfur bacteria, Oxidation.
Identifiers: *Zinc sulfide, Substrate utilization, Substrates, Biological activity.

The effects of carbon dioxide-enriched air on the rate of zinc extraction during the microbiological leaching of a high-grade zinc concentrate by Thiobacillus ferrooxidans have been studied. Under normal air-aeration conditions, the leach rate is limited initially by the availability of solid substrate surface area per unit volume of leach liquor, then by availability of carbon dioxide. If carbon dioxide-enriched air is supplied, along with excess substrate, the zinc extraction rate increases as the carbon dioxide content increases until some other, as yet unknown, factor becomes limiting. (Holoman-Battelle)
W73-04855

MODEL FOR THE GROWTH OF AEROBIC MICROORGANISMS UNDER OXYGEN LIMITING CONDITIONS,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
D. N. Ryder, and C. G. Sinclair.
Biotechnology and Bioengineering, Vol 14, No 5, p 787-798, September 1972. 6 fig, 14 ref.

Descriptors: *Growth rates, *Model studies, *Limiting factors, *Oxygen sag, Aerobic conditions, Aerobic bacteria, Fungi, Anaerobic conditions, Deficient elements, Mathematical studies, Computers, Data processing.
Identifiers: *Substrate concentration, *Aerobic microorganisms, Substrate utilization, Candida utilis, Data interpretation, Glucose.

A simple dynamic model is proposed which will allow fermenters to be run at throughputs which fully utilize the mass transfer capabilities of the fermenters while not decreasing the yield from the substate. The model is compared with one previously proposed, which was originally formulated for double substrate limitation when both substrates were supplied in the feed. Computer solutions of the model are given which show the effects of the parameters used. Experimental results from growing Candida utilis on a high concentration of glucose were similar to those predicted by the model. (Holoman-Battelle)
W73-04856

EFFECT OF GLUTARALDEHYDE ON THE OUTER LAYERS OF ESCHERICHIA COLI,
Welsh Coll. of Advanced Technology, Cardiff. Welsh School of Pharmacy.
T. J. Munton, and A. D. Russell.
Journal of Applied Bacteriology, Vol 35, No 2, p 193-199, June 1972. 4 fig, 1 tab, 18 ref.

Descriptors: *E. coli, *Proteins, Aqueous solution, Cytological studies, Separation techniques Electrophoresis, Adsorption, Protective coatings, Inhibitors, Surfactants, Cultures, Phenols, Temperature, Spectrophotometry, Spores, Hydrogen ion concentration, Bactericides, Solvent extractions.
Identifiers: *Glutaraldehyde, Polysaccharides, Sodium lauryl sulfate, Bacillus subtilis, Sample preparation, Culture media, Agars.

The effects of glutaraldehyde on the outer layers and especially the protein components of Escherichia coli were studied by the following methods: (1) determining amount of sodium lauryl sulphate (SLS) in the cell walls by spectrophotometry, (2) determining electrophoretic mobilities of suspended spores or vegetative cells with a microelectrophoresis apparatus, and (3) extracting purified protein and polysaccharide components from E. coli using homogenized phenol and water at 68 C. At pH 3 and 8 sodium lauryl sulphate lysed cell walls of Escherichia coli. Pretreatment with glutaraldeyde at pH 3 and at pH 8 prevented this lysis. SLS induced maximum lysis of E. coli cells at 40 degrees; pretreatment of cells with glutaraldehyde also prevented this lysis. Electrophoretic studies indicated that glutaraldehyde accumulated on the surface of E. coli cells more rapidly in acid than in alkaline conditions, and that it blocked amino groups on the surface layer of Bacillus subtilis spores. The relationship of these findings to the bactericidal efficiency of glutaraldehyde in acid and alkaline solution is discussed. (Byrd-Battelle)
W73-04857

GROWTH AND CELLULASE FORMATION BY CELLVIBRIO FLUVUS,
Uppsala Univ. (Sweden). Biokemiska Institutionen.
B. Berg, B. v. Hofsten, and G. Pettersson.
Journal of Applied Bacteriology, Vol 35, No 2, p 201-214, June 1972. 8 fig, 1 tab, 20 ref.

Descriptors: *Growth, *Microbial degradation, Cellulose, Aerobic bacteria, Cotton, Lignins, Amino acids, Nitrates, Ammonium compounds, Nitrogen, Enzymes, Hydrogen ion concentration, Proteins, Cultures, Water pollution sources, Organic acids, Hydrolysis, Distillation, Colorimetry, Chemical degradation, Fibers (Plant).
Identifiers: *Cellvibrio fulvus, *Cellulase, Cellulolytic bacteria, Sugars, Ion exchange chromatography, Substrate utilization, Polysaccharides, Glucose, Culture media.

Growth and cellulase formation by Cellvibrio fulvus were studied by investigating how culture conditions influence the formation of carboxymethylcellulose (CMC) hydrolyzing enzyme and some properties of the enzyme components occurring in culture filtrates of stationary phase cultures. Culture samples were allowed to incubate and the protein content was determined by standard techniques, hydrolysis of CMC by a colorimetric method, a vicel degradation activity by a standard procedure, and protein concentrations in cellulolytic enzymes by ion exchange chromatography. This aerobic cellulolytic bacterium grew on several sugars and polysaccharides, but not on highly substituted cellulose derivatives, organic acids and alcohols. Whereas no growth was obtained on long cotton fibres, it occurred on such fibres cut into small pieces, and on filter paper and chromatography powders derived from cotton.

Lignin free wood pulp was rapidly degraded. The organisms grew best at pH 7-8 and utilized nitrate, ammonium and some amino acids as nitrogen sources. The bacteria have cell-bound cellulase but the anzyme was also found in the culture medium. Glucose repressed cellulase formation and the enzyme activity of cultures grown on cellulose was much higher than on sugars. Reducing sugar was not detected in cellulose cultures. The pH optimum for hydrolysis of CMC was 7 and the enzyme was inhibited by mercuric acetate but not by p-chloromercuribenzoate or EDTA. Fractionation of cellulase preparations from cultures grown on partially hydrolyzed filter paper gave many components of different molecular weights. The activities of these components against carboxymethylcellulose and microcrystalline cellulose differed . (Byrd-Battelle)
W73-04858

INHIBITION OF FUNGAL GROWTH IN THE CULTURAL ISOLATION OF MYCOBACTERIA,
Agricultural Research Service, Ames, Iowa.
For primary bibliographic entry see Field 05A.
W73-04862

QUALITATIVE CONSEQUENCES OF RANDOMNESS IN A LINEAR KINETIC SYSTEM,
Rockland State Hospital, Orangeburg, N.Y. Div. of Theoretical Biokinetics.
J. R. Gradijan, and P. E. E. Bergner.
Biometrics, Vol 28, No 2, p 313-328, June 1972. 2 fig, 7 ref.

Descriptors: *Stochastic processes, *Model studies, *Tracers, *Mathematical models, Probability, Size, Absorption, Path of pollutants, Movement, Mathematical studies.
Identifiers: *Randomization, *Biokinetics, *Stochastic model, Data interpretation, Sample size, Quatitative analysis, Quantitative estimations, Deterministic model.

An analysis has been made of some consequences of randomness implied by the experimental procedure on a deterministic kinetic system and observations made of the difference between the mathematical expectation given by the stochastic model and the corresponding deterministic function. In order to determine whether meaningful data interpretation is possible without estimating any model parameters, certain biological data have been subjected to the qualitative modeling approach. Such data, either by convenience or necessity, are often charcterized by large spread, small sample size, non-stationarity, and other qualities that make it difficult or impossible to apply conventional statistical methods of analysis. The technique is illustrated by the analysis of data representing the uptake of acetylcholine by synaptic vesicles, and it is demonstrated that a number of properties of that biological process can be determined from what would normally be considered rather poor data. In particular, it is shown that a deterministic model in this case appears to be insufficient to represent the system and that at least two types of randomness are involved. (Holoman-Battelle)
W73-04865

GROWTH MODELS OF CULTURES WITH TWO LIQUID PHASES. VI. PARAMETER ESTIMATION AND STATISTICAL ANALYSIS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
P. S. Shah, L. E. Erickson, and L. T. Fan.
Biotechnology and Bioengineering, Vol 14, No 4, p 533-570, July 1972. 11 fig, 6 tab, 28 ref.

Descriptors: *Mathematical models, *Cultures, Computers, Computer programs, Growth rates, Statistical methods, Model studies, Fermentation, Estimating equations, Saturation, Absorption.
Identifiers: *Culturing techniques, *Growth kinetics, Substrate concentration, Substrate utilization, Candida lipolytica, Desorption, n-Hexadecane.

Parameter estimation studies and statistical analyses have been conducted employing mathematical models developed previously by the investigators and experimental data collected by the last author. A batch fermentation process in which Candida lipolytica were cultered on n-hexadecane dissolved in dewaxed gas oil was employed to obtain the experimental data. The kinetic data from a number of batch experiments conducted at different initial substrate concentrations and different dispersed phase volume fractions were analyzed assuming that the basic model parameters (maximum specific growth rate, saturation constant, substrate phase equilibrium constant, adsorption constant, desorption constant) did not change from experiment to experiment. A modified Gauss-Newton method was used to minimize the conventional sum of squares criterion on computer. The individual confidence intervals were obtained for each individual parameter. The models were compared employing the F-test for equality of variances and an analysis of residuals. For the two best models, the estimated parameter values were compared with available experimental information. The results showed good agreement between the experimental data and the values predicted by the mathematical models. The results suggest that growth on small segregated drops may be more important than continuous phase growth on dissolved substrate. (See also W73-04870) (Byrd-Battelle)
W73-04869

GROWTH MODELS OF CULTURES WITH TWO LIQUID PHASES. VII. SUBSTRATE DISSOLVED IN DISPERSED PHASE; EFFECT OF DISPERSED PHASE VOLUME AND TEMPERATURE,
Ceskoslovenska Alkademie Ved, Prague. Inst. of Microbiology.
A. Prokop, and L. E. Erickson.
Biotechnology and Bioengineering, Vol 14, No 4, p 571-586, July 1972. 3 fig, 3 tab, 24 ref.

Descriptors: *Environmental effects, Yeasts, Fungi, Oil, Organic compounds, Temperature, Growth rates, Fermentation, Methodology, Mathematical models, Pollutant identification, Optimization, Model studies.
Identifiers: *Candida lipolytica, *Gas oil, *Liquid-phase cultures, *Growth models, *Culturing techniques, Culture media, n-Hexadecane, Batch cultures, Arrhenius equation, Substrate utilization, Aliphatic hydrocarbons, Paraffins.

The effects of dispersed phase volume and temperature on the batch growth of Candida lipolytica on gas oil were investigated in order to optimize batch cultivation with respect to the dispersed phase volume for possible use in predicting optimal operating conditions for a single stage chemostat. Growth parameters are presented for two sets of experiments. The shape of growth curves was basically similar to the system composed of n-hexadecane dissolved in dewaxed gas oil, in spite of the complex nature of the substance. All of the batch growth curves exhibited a linear growth region. The rate of linear growth and its length varied with change in dispersed phase volume. The effect of temperature on growth rate was investigated for temperatures ranging from 23 C to 34 C. The results show a smaller activation energy during linear growth than during the early stages of batch growth. These results are analyzed from the viewpoint of growth models presented previously. The results indicate that growth at drop surfaces is important and that segregation effects may be important. (See also W73-04869) (Long-Battelle)
W73-04870

MEASUREMENTS OF MICROBIAL ACTIVITY AND ORGANIC MATERIAL IN THE WESTERN MEDITERRANEAN SEA,
Southampton Univ. (England). Dept. of Oceanography.
M. W. Banoub, and P. J. leB. Williams.
Deep Sea Research, Vol 19, No 6, p 433-443, June 1972. 4 tab, 33 ref.

Descriptors: *Microbial degradation, *Measurement, Organic compounds, Chemical analysis, Nutrients, Infrared radiation, Ultraviolet radiation, Water analysis, Amino acids, Salinity, Water quality, Phosphorus, Filtration, Water pollution sources, Water temperature, Phosphates, Nitrates, Nitrites, Dissolved oxygen.
Identifiers: *Mediterranean Sea, *Particulate organic matter, *Dissolved organic matter, Sample preparation, Organic carbon, Organic nitrogen, Substrate utilization, Fate of pollutants.

Measurements of microbial activity and organic material are reported for four stations in the western Mediterranean Sea. Water samples were collected and analyzed for particulate carbon and nitrogen after combustion by infra-red analysis and colorimetry, respectively; the limit of detection of the method was 1 microgram of nitrogen per liter. The filtrates of the samples were analyzed for dissolved organic carbon, total nitrogen, and total phosphorus by utilizing modified ultraviolet irradiation procedures; the limit of detection approached 0.5 microgram-atomic nitrogen per liter. Microbial activity was measured by the turnover of glucose and amino acids, which was determined by following the uptake and respiration of added trace amounts of both uniformly carbon-14-labelled-D-glucose and a L-amino acid mixture. In near surface water the rate of heterotrophic turnover of glucose and amino acids was 30-50 percent per day; the rate of turnover decreased with depth, it was detectable at 300-500 m but not at 1800 m. The organic analyses of the water column indicated a transition zone in the region of 100 m with higher concentrations above than below; the difference was greatest in the particulate fraction. The inorganic nutrients show the reverse distribution to the organic fraction. Typical concentrations for the water in the first 100 m and the deeper water were respectively: 0.05-0.15 and 0.03-0.08 micrograms-at P/l for dissolved organic phosphorus; 3.0-8.0 and 2.0-6.0 micrograms-at N/l for dissolved organic nitrogen plus ammonia; 1.2-5.0 and 0.5-1.0 micrograms N/l for particulate nitrogen; 400-700 and 200-400 micrograms C/l for dissolved organic carbon and 18-50 and 5-10 micrograms C/l for particulate organic carbon. (Byrd-Battelle)
W73-04871

DEGRADATION AND MINERALIZATION OF PETROLEUM BY TWO BACTERIA ISOLATED FROM COASTAL WATERS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Biotechnology and Bioengineering, Vol 14, No 3, p 297-308, May 1972. 5 fig, 1 tab, 24 ref.

Descriptors: *Oil, *Microbial degradation, Sea water, Pollutant identification, Gas chromatography, Mass spectrometry, Metabolism, Marine bacteria, Aerobic bacteria, Oily water, Cultures, Organic compounds, Isolation, Carbon dioxide.
Identifiers: *Mineralization, *Coastal water, n-Paraffins, Crude oil, Flavobacterium, Brevibacterium, Aliphatic hydrocarbons, Substrate utilization, Chemical composition, Hydrocarbon-oxidizing bacteria, n-Hexadecane, n-Octadecane, n-Nonadecane, Enrichment, n-Tetradecane, n-Dodecane, n-Undecane, n-Pentadecane, n-Eicosane, n-Heneicsane, n-Docosane, n-Nonadecane, Pristane, n-Decane, n-Tridecane, n-Heptadecane.

Within the framework of a study on the oil biodegradation potential of the sea the ability of a

Flavobacterium sp. and Brevibacterium sp. to metabolize a paraffinic crude oil and a chemically defined hydrocarbon mixture was investigated. Major components of the crude oil were identified by combination gas chromatography and mass spectrometry. The rate and extent of total hydrocarbon biodegradation were measured. In addition, CO2 evolution from the crude oil was continuously monitored in a shaker-mounted gas train arrangement. Degradation started after a 2 to 4 day lag period, and reached its maximum within two weeks. At this time up to 60 percent of the crude oil and 75 percent of the model hydrocarbon mixture, each added at the level of 1 ml per 100 ml artificial sea water, were degraded. Mineralization (conversion to CO2) was slightly lower due to formation of products and bacterial cell material. n-Paraffins were preferentially degraded as compared to branched chain hydrocarbons. Biodegradation of n-paraffins in the range of C12 to C20 was simultaneous; no diauxie effects were observed. (Holoman-Battelle)
W73-04872

DEGRADATION AND MINERALIZATION OF PETROLEUM IN SEA WATER: LIMITATION BY NITROGEN AND PHOSPHORUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Biotechnology and Bioengineering, Vol 14, No 3, p 309-318, May 1972. 5 fig, 15 ref.

Descriptors: *Oil, *Sea water, *Biodegradation, *Essential nutrients, *Microbial degradation, Nitrogen, Phosphorus, Limiting factors, Chemical reactions, Pollutant identification, Nitrates, Phosphates, Chemical analysis, Separation techniques, Sampling, Organic compounds.
Identifiers: *Mineralization, *Hydrocarbon-degrading microorganisms, *Crude oil, Carbon dioxide evolution technique, Fate of pollutants, Petroleum products, Residual weight procedure, Gas liquid chromatography, Sample preparation, Pristane.

Seawater of salinity 2.85 percent and pH 8.3 was collected in a relatively unpolluted area off the coast of New Jersey. The viable microbial count was 300/ml, and the total N and P concentrations were 98 and 7 micrograms/100 ml seawater, respectively. Biodegradation and mineralization of petroleum, added at 1 percent (v/v) to the freshly collected seawater, were measured using gas-liquid chromatographic, residual weight, and CO2 evolution techniques. Only 3 percent of the added petroleum was biodegraded and 1 percent was mineralized in unamended seawater after 18 days of incubation. Added individually, nitrate (0.01 M) or phosphate (35 nM) supplements caused little improvement, but when added in combination, they increased petroleum biodegradation and mineralization to 70 percent and 42 percent, respectively. No measurable CO2 was produced from filter-sterilized seawater with petroleum or from natural seawater without petroleum even when supplemented with mineral nutrients. Natural seawater with added petroleum but no mineral supplements produced CO2 at a very low rate; only 1 percent of the theoretical maximum was attained during 18 days of incubation. (Long-Battelle)
W73-04873

BACTERIA WHICH ATTACK PETROLEUM HYDROCARBONS IN A SALINE MEDIUM,
Naval Weapons Center, China Lake, Calif. Michaelson Labs.
G. Soli, and E. M. Bens.
Biotechnology and Bioengineering, Vol 14, No 3, p 319-330, May 1972. 9 fig, 2 tab, 4 ref.

Descriptors: *Microbial degradation, *Saline water, Pollutant identification, Cultures, Marine bacteria, Aerobic bacteria, Metabolism, Sea water, Oxidation, Oily water.
Identifiers: *Hydrocarbon-oxidizing bacteria, *Corynebacterium, *Arthrobacter, *Achromobacter, Aromatic hydrocarbons, Culturing techniques, Culture media, Chemical recovery, Crude oil, Substrate utilization, Isoparaffins, n-Paraffins, Petroleum residues, Petroleum, Scanning electron microscopy, Flame ionization gas chromatography, Naphthalene, Pentadecane, Heptane, Fluorene, Anthracene, Fluoranthene, Undecane, n-Hexadecane, n-Decane, Decanol, Tetradecane, Heptadecane, Octadecane, Eicosane, Acenaphthene, Decalin, Dodecane, Tetracosane.

An investigation was made of organisms which can digest petroleum hydrocarbons in a saline environment and the conditions under which the biological process of oil degradation can be further enhanced and subsequently used on a practical basis. Bacterial strains were isolated from California coastal areas which showed the ability to oxidize normal paraffins, iso-paraffins, and aromatic hydrocarbons in a synthetic seawater medium. The ability to utilize a particular hydrocarbon was established not only on the basis of visible bacterial growth but also through a chromatographic technique which was standardized and which could define the amount of each hydrocarbon consumed by the bacteria in a mixture. Some of the strains exhibited vigorous hydrocarbon oxidation when exposed to synthetic mixtures of hydrocarbons as well as crude oil. Under conditions of aeration and agitation, mixed cultures could destroy approximately 50 percent of a South Louisiana crude oil in a period of 48 hr. (Holoman-Battelle)
W73-04874

EMULSIFICATION AND DEGRADATION OF 'BUNKER C' FUEL OIL BY MICROORGANISMS,
University of Western Ontario, London. Faculty of Engineering Science.
J. E. Zajic, and B. Supplisson.
Biotechnology and Bioengineering, Vol 14, No 3, p 331-343, May 1972. 3 fig, 4 tab, 12 ref.

Descriptors: *Microbial degradation, *Sewage bacteria, *Fungi, Metabolism, Separation techniques, Microorganisms, Gas chromatography, Biomass, Freeze drying.
Identifiers: *Fuel oil, *Bunker C oil, *Emulsification, Enrichment, Culture media, Substrate utilization, n-Paraffins, Culturing techniques, Chemical composition, Chemical recovery, Aliphatic hydrocarbons, Gel permeation chromatography, Adsorption chromatography, Nesslerization.

An enrichment culture procedure has been used to isolate mixed culture systems which grow upon 'Bunker C' fuel oil. When inoculated into a mineral salts aqueous medium containing Bunker C oil, the mixed cultures initiate oil emulsification. Emulsification usually is observed in 24-48 hr. The role of microbes in this emulsification is discussed. It appears that certain metabolic products produced by the microbe possess properties of surfactants. Bacteria and fungi have been isolated which possess the ability to cause emulsification. Freeze-dried biomass is also capable of emulsifying oil. Chromatographic analyses of biodegraded Bunker C fuel oil show that microorganisms selectively metabolize the n-paraffin fraction. (Holoman-Battelle)
W73-04875

MEASUREMENTS ON THE INTERFACIAL AREAS OF HYDROCARBON IN YEAST FERMENTATIONS AND RELATIONSHIPS TO SPECIFIC GROWTH RATES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
D. I. C. Wang, and A. Ochoa.
Biotechnology and Bioengineering, Vol 14, No 3, p 345-360, May 1972. 10 fig, 1 tab, 8 ref.

Descriptors: *Fermentation, *Yeasts, *Growth rates, Surfaces, Permeability, Oil-water interfaces, Metabolism, Nutrients, Cultures, Fungi, Chemical reactions.
Identifiers: *Surface area, *Hexadecane, *Candida intermedia, Growth media, Substrate concentration, Sedimentometer, Hydrocarbons, Interfacial area, Culture media.

Experiments have been performed to assess the absolute values of the interfacial area of hexadecane as the carbon source for the growth of Candida intermedia. A sedimentometer, mounted directly in the fermenter, was used to measure the interfacial hydrocarbon area during active growth of this organism. The specific hydrocarbon interfacial area was found to be directly related to the impeller speed, hydrocarbon concentration and surfactant concentration in a 1-liter working volume, turbine-agitated fermenter. The specific growth rate was in turn found to be directly related to the specific hydrocarbon interfacial area. Cessation of logarithmic growth and onset of linear growth was found at all instances to be governed by the specific hydrocarbon surface area. (Mackan-Battelle)
W73-04876

CONVERSION OF DETERIORATED METAL CUTTING FLUIDS INTO PROTEIN,
McNeese State Univ., Lake Charles, La. Dept. of Microbiology.
H. K. Speidel, and E. O. Bennett.
Biotechnology and Bioengineering, Vol 14, No 3, p 361-377, May 1972. 5 fig, 6 tab, 13 ref.

Descriptors: *Soil bacteria, *Soil fungi, *Proteins, *Liquid wastes, Chromatography, Amino acids, Waste treatment, Aerobic bacteria, Growth rates, Nutrient requirements, Essential nutrients, Growth rates, Chemical analysis, Chemical properties, Chemical reactions, Isolation, Colorimetry, Organic acids.
Identifiers: *Substrate utilization, *Fate of pollutants, *Biological transformation, *Metals industry, Achromobacter, Culture media, Aspartic acid, Serine, Glutamic acid, Proline, Glycine, Alanine, Cystine, Tyrosine, Histidine, Arginine, Threonine, Valine, Methionine, Isoleucine, Leucine, Phenylalanine, Lysine, Petroleum sulfonate medium, Biochemical tests, Pseudomonads.

Six soil isolates including Achromobacter sp., fungi, gram-negative bacilli, pseudomonads, and an unidentified bacterium were grown on a petroleum sulfonate medium and analyzed chromatographically to determine their amino acid composition. The analysis for amino acids was carried out upon an 0.1 ml sample using the Moore and Stein Method on a Phoenix Model K-8000-C automatic recording amino acid analyzer. The organisms were also examined to determine their growth rate in the petroleum medium, their percent conversion of hydrocarbon to dry cell mass, their protein content, and their possible use as a food or food supplement. It was found that the isolates varied extensively as to their amino acid composition. Several of the isolates converted the hydrocarbons to cell mass with relative ease. The proteins of four of the isolates appear to be suitable as a good food source, and the protein of one of the remaining isolates appears to be a very good food supplement. (Long-Battelle)
W73-04877

SEWAGE DISPOSAL AT POINT BARROW, ALASKA,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
W. L. Boyd, B. P. Klubek, and J. W. Boyd.
Technical Report No 1, February 19, 1972. 50 p, 14 fig, 8 tab, 33 ref.

Descriptors: *Bioindicators, *Domestic wastes, *Sewage lagoons, *Bottom sediments, *Coliforms, *Enteric bacteria, *Nitrogen fixing

bacteria, *Iron bacteria, Runoff, Sewage sludge, *Alaska, Population, Water analysis, E. coli, Streptococcus.
Identifiers: Fecal streptococci, *Point Barrow (Alas).

A study of the Middle Salt Lagoon, the sewage depository of the Naval Arctic Research Laboratory, was initiated during June, 1971. Microbial analyses were carried out on runoff, Lagoon water, and bottom sediments throughout the summer. Standard potability tests showed that runoff water usually lacked the indicator groups, coliform bacteria and fecal streptococci. Large (100 ml) samples taken from the Lagoon itself showed marked variation with a slight majority of negatives recorded till late July when the pattern was reversed. Ancillary experiments showed that these indicator groups died rapidly in the Lagoon environment and emphasized the need for studies of the death rate of enteric pathogens v. indicator organisms and for seeking other possible microbial indicator-systems. Bacterial numbers were lower in runoff water than in either Lagoon water or bottom sediments. Lagoon water was low in thermophilic, iron-utilizing, and marine microorganisms. Possible nitrogen-fixing bacteria were found in the same range as other mesophilic forms, perhaps a reflection on the methodology of isolation. Maximum bacterial counts from water were not higher than those found in unpolluted local waters sampled during the same seasonal period despite the large amounts of organic matter available as potential food. Bottom sediments reflected the general pattern of the overlying water except that mesophilic and psychrophilic bacteria were in higher numbers. Possible marine forms were also found, at times in a range paralleling the former groups. Nitrogen fixing bacteria were generally lower in numbers than found in Lagoon water. (Little-Battelle)
W73-04883

EFFECT OF CHEMICAL STRUCTURE ON MICROBIAL DEGRADATION OF METHYL-SUBSTITUTED ALIPHATIC ACIDS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
M. W. Hammond, and M. Alexander.
Environmental Science and Technology, Vol 6, No 8, p 732-735, August 1972. 2 fig, 2 tab, 18 ref.

Descriptors: *Microbial degradation, *Soil microorganisms, *Pollution identification, Biodegradation, Soil bacteria, Gas chromatography, Metabolism, Mass spectrometry, Cultures, Separation techniques, Oxidation, Chemical reactions, Aerobic bacteria, Isolation, Dissolved oxygen, Biochemical oxygen demand, Electrodes, Laboratory equipment, Instrumentation, Solvent extractions, Treatment, Organic acids.
Identifiers: *Aliphatic acids, Metabolites, Mass spectra, Sample preparation, Methyl-substituted aliphatic acids, Arthrobacter, 2 2-dimethylglutaric acid, 2 2-dimethyl-3-oxopropanoic, 2 2-dimethyl-3-oxybutanoic acid, 4 4-dimethylvaleric acid, Fatty acids, Trimethylacetic acid, Culture media, Ionization detectors, Flame ionization detector, Valeric acid, Hexanoic acid, Octanoic acid, Malonic acid, Dimethylmalonic acid, Succinic acid, Glutaric acid, Substrate utilization.

The ability of soil microorganisms to degrade unsubstituted mono-and dicarboxylic acids and dimethyl-substituted compounds was determined by analyzing metabolites from bacteria previously exposed to these acids. For analysis the metabolites were solvent-extracted from the bacteria, separated by gas chromatography, and identified by mass spectrometry. The rates of bacterial degradation of the organic acids were determined by measuring dissolved oxygen in a liquid medium. The results showed that soil microorganisms rapidly degraded unsubstituted mono- and dicarboxylic acids, but all dimethyl-substituted compounds tested were relatively resistant to microbial attack. An Arthrobacter formed a single product in large amounts from 2,2-dimethylglutaric acid. Gas chromatography-mass spectrometry suggested that the metabolite was 2,2-dimethyl-3-oxopropanoic or 2,2-dimethyl-3-oxobutanoic acid. Only a single product was detected in cultures of a gram-negative bacterium grown on 4,4-dimethylvaleric acid, and this was identified as trimethylacetic acid. It is suggested that dimethyl substitution renders fatty acids refractory to microbial degradation by posing a hindrance to beta-oxidation. (Long-Battelle)
W73-04884

MERCURY UPTAKE BY POLYAMINE-CARBOHYDRATES,
Western Regional Research Lab., Berkeley, Calif.
M. S. Masri, and M. Friedman.
Environmental Science and Technology, Vol 6, No 8, p 745-746, August 1972. 1 tab, 6 ref.

Descriptors: *Mercury, *Absorption, *Carbohydrates, Cellulose, Polymers, Organic compounds, Path of pollutants, Aqueous solutions, Separation techniques, Resins, Amino acids, Filtration, Proteins, Distribution.
Identifiers: Polyamine, Chitosan, Chitin, Starch, Dialdehyde starch, Methylene dianiline, Mercury chloride, Atomic absorption spectrophotometry, Wool, Phenylenediamine.

A study was conducted to compare mercury binding by dialdehyde starch (DAS) derivatives with binding by natural and modified carbohydrates, poly (aminostyrene), and wool. The results suggested that polyamino derivatives of carbohydrates might be useful in recovering mercury compounds from water. They also suggest a possible role of amino groups, other basic groups in proteins, and other biological materials in the accumulation and distribution of mercury in the environment. In the experiments, DAS-MDA and DAS-PDA resins were prepared in similar manners by stirring for 2-3 days at room temperature, filtering, and washing. Mercury uptake was measured by equilibrating a weighed sample of adsorbent in a measured volume of HgC12 solution for one day at room temperature with a mechanical shaker. The concentration in the mother liquor was measured and mercury uptake was calculated by the difference between this and the original concentration. Atomic absorption spectrophotometry was used to measure the mercury concentrations. (Mortland-Battelle)
W73-04886

RELATIONSHIPS BETWEEN LAKE TROPHIC STATE AND NITROGEN AND PHOSPHORUS LOADING RATES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05C.
W73-04888

ALLOCATION OF CATION EXCHANGE CAPACITY TO SOIL FRACTIONS IN SEVEN SURFACE SOILS FROM PANAMA AND THE APPLICATION OF A CATION EXCHANGE FACTOR AS A WEATHERING INDEX,
Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica).
For primary bibliographic entry see Field 02G.
W73-04890

FERTILIZERS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W73-04895

SEDIMENT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
A. R. Robinson.
Journal of Soil and Water Conservation, Vol 26, No 2, p 61-62, March-April, 1971. 8 ref.

Descriptors: *Water pollution control, *Sediment control, *Erosion, Sediment transport, Sediment yield, Sediments, Sediment load, Sedimentation, Pollution abatement.

Sediment depletes the land resources from which it is derived and impairs the quality of the water in which it is entrained and deposited. It is the nation's largest single water pollutant. Five aspects of sediment pollution are discussed: sediment properties; sediment yield; sediment transport; sediment deposition; and stream channel systems. The challenge is to reduce erosion; control the energy of stream flow; and create, where possible, nonerodible stream boundaries. (Skogerboe-Colorado State)
W73-04896

PESTICIDES,
Illinois Univ., Urbana. Dept. of Zoology.
R. L. Metcalf.
Journal of Soil and Water Conservation, Vol 26, No 2, p 57-60, March-April, 1971. 1 fig, 2 tab, 12 ref.

Descriptors: *Water pollution sources, *Pesticides, *Agricultural chemicals, Water pollution, Pest control, Chemical wastes, Pollution abatement.

The present use of pesticides is reviewed, with statistics given showing the important role pesticides play in agriculture. The agri-ecosystem however, does not exist in vacuum; the effects on the quality of the total environment must be weighed. Presently, there is only superficial knowledge of effects of long term use of pesticides on the environment, and while they are microchemical pollutants, such micropollution is biologically significant as in the case of DDT in Lake Michigan and mercury levels in Lake Erie. Pesticides will remain indispensable in the foreseeable future, but should be controlled by prescription sale, supervision of use by trained plant pesticide control specialists or phytopharmacists, and by developing selective bio-degradable pesticides. (Skogerboe-Colorado State)
W73-04897

FARM NITRATES..NO MENACE TO THE RIO GRANDE.
Agricultural Research, United States Department of Agriculture, p 3-4, April, 1970.

Descriptors: *Nitrates, *Water quality, Water pollution sources, Fertilizers, *Rio Grande River, Irrigation effects.

As part of a 30-year study of salt-balance conditions in three irrigated areas along the Rio Grande river, Scientists obtained information about NO3-N content over a period of increasing use. Data indicate no significant stream pollution by NO3-N from nitrogen fertilizer. The greatly increased use of nitrogen fertilizer in the Rincon and Mesilla valleys has not increased the NO3-N load for the Upper Rio-Grande. The rise in NO3-N at the El-Paso-Hudspeth County line may be due in part to fertilizer, with most of the rise resulting from decreasing irrigation return flow and possibly treated sewage from the city of El Paso. (Skogerboe-Colorado State)
W73-04898

MODEL THEORY FOR PREDICTING PROCESS OF LEACHING,
Utah State Univ., Logan.
J. F. Alfaro, and J. Keller.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 13, No 3, p 362-368, March, 1970. 7 fig, 8 ref.

Descriptors: Soil science, *Soil chemistry, *Leaching, Model studies, Salinity, Irrigation practices, Path of pollutants, Water pollution sources.
Identifiers: Salt loading, Salinization.

A theory for using physical scaled models to predict the leaching process is developed and tested. This theory is based on the fact that when the function that governs a process is the same for two or more physical systems, observations made on one system predict the performance of the other. The theory was tested on uniform and layered soil profiles constructed of artifically salininzed samples of Bear River sand and nibley silty clay loam soil, while the layered profiles consisted of the nibley soil only. Findings suggest that the effluent concentration curve can be predicted from the results obtained by leaching a scaled model. (Skogerboe-Colorado State)
W73-04902

INFLUENCE OF SOIL SALINITY ON PRODUCTION OF DRY MATTER AND UPTAKE AND DISTRIBUTION OF NUTRIENTS IN BARLEY AND CORN: I. BARLEY (HORDEUM VULGARE L.),
Agricultural Experiment Station, Baghdad (Iraq). Dept. of Soils.
For primary bibliographic entry see Field 03C.
W73-04916

ADSORPTION AND TRANSPORT OF AGRICULTURAL CHEMICALS IN WATERSHEDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
M. H. Frere.
Paper, pre12 p,sented at the 1971 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 7-10, 1971. 12 p,1 fig, 12 ref.

Descriptors: *Path of pollutants, *Agricultural chemicals, Leaching, Adsorption, Watersheds, Soil-water-plant relationships, Pollutants.

A descriptive model of the pathways of chemicals in the soil-water-plant system is used to catalogue the properties of agricultural chemicals that are important to their movement in watersheds. The chemical interactions dictate the pathways to be followed while the behavior of water controls the time and amount of movement. (Skogerboe-Colorado)
W73-04927

SURFACE WATER QUALITY IS INFLUENCED BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Morris, Minn. Central Soil Conservation Research Center.
R. F. Holt.
Paper No 71-740, presented at the 1971 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 7-10, 1971. 19 p, 3 tab, 34 ref.

Descriptors: *Water quality, *Pollutants, *Water pollution, *Water pollution sources, Farm wastes, Watershed management, Land management, Watersheds, Soil amendments, Fertilization.

Fertilization, animal waste handling, soil amendments and cropping practices can all influence the quality of water that runs off an agricultural watershed. Maintenance of high quality surface water demands the development of practices which can minimize the nutrient, pesticide, manure and sediment loading of water impoundments. The physical trapping or tying down of solid particles can control sediment delivery but not dissolved substances. Utilization of the sorptive capacity of the soil offers a mechanism for controlling the movement of soluble contaminants into water supplies. (Skogerboe-Colorado)
W73-04928

THE MEASUREMENT AND MECHANISM OF ION DIFFUSION IN SOILS VI. THE EFFECT OF CONCENTRATION AND MOISTURE CONTENT ON THE COUNTER-DIFFUSION OF SOIL PHOSPHATE AGAINST CHLORIDE ION,
School of Agriculture, Aberdeen (Scotland). Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 02G.
W73-04930

LEAD CONTAMINATION OF SOME AGRICULTURAL SOILS IN WESTERN CANADA,
Department of Agriculture, Agassiz (British Columbia). Research Station.
M. K. John.
Environmental Science and Technology, Vol 5, No 12, p 1199-1203, December 1971. 1 fig, 4 tab, 15 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, *Lead, Toxicity, Pollutants, Water pollution sources, Soil analysis, *Path of pollutants, Soil contamination.

Nitric acid soluble lead in 700 samples mostly from agricultural soilsin British Columbia was related to proximity to industrial and population centers. The soluble lead was found to be immobilized in surface horizons. Soils taken near a battery smelter were found to be highly contaminated with lead and the extent of contamination decreased with distance from the smelter. (Skogerboe-Colorado State)
W73-04965

CONTAMINATION OF ROADSIDE SOIL AND VEGETATION WITH CADMIUM, NICKEL, LEAD, AND ZINC,
Agricultural Research Service, Beltsville, Md. Soils Lab.
J. V. Lagerwerff, and A. W. Specht.
Environmental Science and Technology, Vol 4, No 7, p 583-586, July 1970. 2 tab, 36 ref.

Descriptors: *Crop production, Lead, *Zinc, *Nickel, *Cadmium, Air pollution, Soil contamination, Path of pollutants.

Concentrations of Cd, Ni, Pb, and Zn in roadside soil and grass samples from several locations decrease with distance from traffic. These concentrations also decrease with depth in the soil profile. The contamination has been related to the composition of gasoline, motor oil, and car tires, and to roadside deposition of the residues of these materials. (Skogerboe-Colorado State)
W73-04966

NITROGEN FIXATION BY NONSYMBIOTIC MICROORGANISMS IN SOME CALIFORNIA SOILS,
California Univ., Davis.
P. L. Steyn, and C. C. Delwiche.
Environmental Science and Technology, Vol 4, No 12, p 1122-1128, December 1970. 2 fig, 5 tab, 32 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, *Nitrogen compounds, Nitrification, Water pollution sources, Nitrogen fixation, Nitrogen cycle, Nitrogen fixing bacteria, Microorganisms, Microbiology.

The rate of nitrogen fixation by soil samples from various California environments was determined at monthly intervals for a period of one year by comparing direct isotopic observations of fixation rates with rates determined by the acetylene-ethylene method. Annual fixation rates of approximately 5 kilograms nitrogen per hectare per year were observed in the most favorable environment examined, and rates as low as 2 kilograms per year were observed on a more arid site with native vegetation. Observations made by direct isotopic methods compared reasonably well with those obtained with use of the acetylene-ethylene method, but some variability between the two occurred. Limiting factors in the fixation reaction are reported and the significance of observed rates is discussed. (Skogerboe-Colorado State)
W73-04967

RELATIONSHIP OF AUTOMOTIVE LEAD PARTICULATES TO CERTAIN CONSUMER CROPS,
California Univ., Riverside. Air Pollution Research Center.
E. A. Schuck, and J. K. Locke.
Environmental Science and Technology, Vol 4, No 4, p 324-330, April 1970. 4 fig, 9 tab, 8 ref.

Descriptors: *Crop production, *Pollution sources, Pollution effects, *Lead, *Air pollution.
Identifiers: Airborne lead, Soil lead.

Five crops were analyzed for their lead content--cauliflower, tomatoes, cabbage, strawberries, and valencia oranges. In addition, the soil, water, and air in contanct with these crops were analyzed for lead. The combined findings from the edible portion of four of these five crops strongly suggest that automotive lead particulates are not absorbed. They exist rather as a topical dust coating of which at least 50% can be removed by simple water washing. Neither did these crops show any inclination to absorb lead via their root systems. Similar conclusions relative to the fifth crop, i.e., strawberries, cannot be drawn except by analogy to the other crops. In spite of growing near heavily traveled highways, i.e., up to 50,000 vehicles per day, the amount of lead associated with the five crops in an untreated state was never greater than 1 microgram of Pb per gram of fresh weight. The average Pb concentration for the entire crop areas studied was one or two orders of magnitude less than 1 microgram of Pb per gram of fresh weight. (Skogerboe-Colorado State)
W73-04968

CROP RESIDUE DISPOSAL-TILAGE-PLANTING RELATIONSHIPS,
Agricultural Research Service, State College, Miss.
For primary bibliographic entry see Field 03F.
W73-04973

AIR AS A SOURCE OF LEAD IN EDIBLE CROPS,
Ethyl Corp. Research Labs. Ferndale, Mich.
G. Ter Haar.
Environmental Science and Technology, Vol 4, No 3, p 226-230, March, 1970. 1 fig, 5 tab, 15 ref.

Descriptors: *Crop production, *Pollution sources, *Pollution effects, *Lead, *Air pollution.
Identifiers: Airborne lead, Soil lead.

The effect of airborne lead on the lead concentration of the edible and nonedible portions of several important types of food crops was studied by growing crops in greenhouses supplied with filtered and ambient air, and in plots planted in long rows perpendicular to a busy highway. Of the ten crops studied--wheat, potatoes, tomatoes, sweet corn, carrots, cabbage, oats, rice, leaf lettuce, and snap beans--eight were not affected by the concentration of lead in air. In both sets of tests, inedible portions of the plants (bean leaves, corn husks, soybean husks, and oat, wheat, and rice chaff) showed a two- to three-fold increase in lead concentration when grown near the road or in the greenhouse with unfiltered air. The conclusions are reached that lead occurring naturally in the soil is the main source of lead in the edible portion of the crops studied, and that airborne lead, based on the crops studied, contributes 0.5 to 1.5% of the

lead content of the U.S. diet. (Skogerboe-Colorado State)
W73-04975

ENVIRONMENT POLLUTION BY PESTICIDES AND AGRICULTURE IN JAPAN (IN JAPANESE),
For primary bibliographic entry see Field 05G.
W73-04976

GRADED ROWS FOR THE CONTROL OF RILL EROSION,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04D.
W73-04979

PREDICTION OF SEDIMENT YIELDS FROM SMALL WATERSHEDS,
Agricultural Research Service, Riesel, Tex. Soil and Water Research Div.
For primary bibliographic entry see Field 04D.
W73-04980

QUALITY SURFACE IRRIGATION RUNOFF WATER,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
J. A. Bondurant.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 14, No 6, p 1001-1003, June 1971. 1 tab, 7 ref.

Descriptors: *Irrigation practices, *Agricultural runoff, *Water pollution sources, Erosion, Soil conservation, Leaching, Water pollution, Fertilization.
Identifiers: *Fertilizer loss.

Chemical constituent concentrations increase in runoff water during surface irrigation because of incorporation of undissolved fertilizer particles in the irrigation stream or by erosion of soil particles having attached fertilizer ions. Analysis of water applied to and runoff from a surface irrigation area near Paul, Idaho, shows only small changes in ion concentrations in runoff water as compared to applied water. More nutrient elements were applied to the field in nitrate, phosphate, and sodium as a percent of the applied were approximately the same magnitude as the loss of water as runoff. (Skogerboe-Colorado State)
W73-04993

SILT TRANSPORT BY THIN FILM FLOW,
Queensland Inst. of Tech., Darling Downs, Toowoomba (Australia).
For primary bibliographic entry see Field 02J.
W73-04997

A PRIMER ON AGRICULTURAL POLLUTION, SUMMARY,
Agricultural Research Service, Beltsville, Md.
C. H. Wadleigh.
Journal of Soil and Water Conservation, Vol 26, No 2, p 63-65, March-April, 1971, 11 ref.

Descriptors: *Water pollution control, Farm wastes, Pesticides, Fertilizers, Irrigation, Sediments, Water pollution sources.

Agriculture is asking itself some penetrating questions about its contribution to pollution: how much, in what manner, and what can be done to reduce the contribution. In an attempt to answer these and other questions, several prominent scientists review the current knowledge about five major groups of pollutants generated by agriculture: animal wastes, fertilizers, irrigation residues, pesticides, and sediment. These assessments are summarized by one of the world's acknowledged experts on agricultural pollution. (Skogerboe-Colorado State)
W73-05002

MOVEMENT OF AGRICULTURAL FERTILIZERS AND ORGANIC INSECTICIDES IN SURFACE RUNOFF,
Missouri Univ., Columbia.
D. M. Sievers, G. L. Lentz, and R. P. Beasley.
Transactions of the ASAE (American Soeciety of Agricultural Engineers), Vol 13, No 3, p 323-325, March 1970. 6 fig, 1 tab, 7 ref.

Descriptors: Water pollution sources, *Agricultural chemicals, *Nitrogen compounds, *Phosphorus compounds, *Chlorinated hydrocarbon pesticides, Translocation, Leaching, Fertilizers, Insecticides, Fishkill, *Path of pollutants, *Missouri, Soil types.
Identifiers: *Missouri, Soil types.

Three central Missouri soils were studied with a wide range of physical properties. Six experimental plots, 45 3/4 in. square were established on each soil in fallow ground. To each plot was applied one of the following organic insecticides: heptachlor, aldrin, phorate, diazinon, carbaryl, and Bux Ten. All were applied in granular form by broadcasting at the rate of 17.1 lb. per acre. Ammonium nitrogen and superphosphate were applied in liquid form at the rate of 200 lb. N and 100 lb. P205 per acre. A sprinkling infiltrometer was used to apply simulated rainfall to the area and samples of the runoff were collected and analyzed. As was expected, the movement of fertilizers and insecticides is greatly influenced by the soil type. (Skogerboe-Colorado State)
W73-05009

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 05G.
W73-05011

FARM ANIMAL WASTE MANAGEMENT.
For primary bibliographic entry see Field 05G.
W73-05013

CULTURE MEDIA FOR DEMONSTRATION OF ENTEROCOCCI: A CONTRIBUTION TO BACTERIOLOGICAL WATER INVESTIGATION IN THE ROUTINE LABORATORY, (IN GERMAN),
H. D. Muench.
Z Gesamte Hyg Grenzgeb. Vol 18, No 1, p 7-9. 1972.
Identifiers: Aerobacter-Aerogenes, Alcaligenes-Faecalis, *Cultures, *Enterococci, *E coli, Polymyxin, Proteus-Hauseri, Proteus-Mirabilis, Pseudomonas-Aeruginosa, Streptococcus-Faecalis, Streptococcus-Faecium, Streptococcus-Liquefaciens.

Formulae are given for liquid media, Kenner KF, Guthof sodium azide bouillon and the Kalina polymyxin bouillon, and for solid media, Slanetz-Bartley, M-Enterococcus Agar, and Slanetz-Bartley modified by Mueller. The azide media showed good selectivity but the polymyxin bouillon gave some negative growth of Enterococci in tests where Enterococci could be isolated. Sodium azide inhibited Escherichia coli, Proteus hauseri (mirabilis) Pseudomonas aeruginosa, Alcaligenes faecalis and Aerobacter aerogenes. The Streptococcus faecalis was most resistant to azide and then S. faecium and S. liquefaciens. The last succumbed to raised azide concentration. For the Slanetz-Bartley modified by Mueller medium, additional azide of 100 to 160% is possible.--Copyright 1972, Biological Abstracts, Inc.
W73-05019

DISSOLVED OXYGEN RESOURCES AND WASTE ASSIMILATIVE CAPACITY OF THE LA GRANGE POOL, ILLINOIS RIVER,
Illinois State Water Survey, Urbana.
T. A. Butts, D. H. Schnepper, and R. L. Evans.
Illinois State Water Survey, Report of Investigation (1973), 27 p, 23 fig, 15 tab, 26 ref.

Descriptors: *Dissolved oxygen, *Oxygen demand, *Waste assimilative capacity, *Water quality control, *Water quality standards, *Illinois, Mathematical models, Statistical methods, Temperature, Monitoring, Path of pollutants.
Identifiers: *Statistical regression methods, *Illinois River.

The objectives established were: (1) to relate observed dissolved oxygen concentrations to flow, temperature, and oxygen demand; (2) to develop a waste assimilative capacity model; and (3) to develop a statistical water quality control chart to aid in the interpretation of data generated by continuous monitoring. This report describes the methodologies selected to achieve these objectives by studying the La Grange Pool on the Illinois River. To develop relationships for achieving the first objective, statistical regression methods were used. Mathematical models were formulated permitting the prediction of average and minimum dissolved oxygen concentrations. The most appropriate approach for defining the waste assimilative capacity was found to be the Black and Phelps method with Velz's modification. The third objective was met by a one-sided quality control chart designed to detect trends deviating from an expected pattern. Valid data input and interpretation permit decisions as to whether the water quality system is in-control, out-of-control or indecisive. (Morparia-Texas)
W73-05020

DETERGENTS AND THE NATION'S WATER,
League of Conservation Voters, Washington, D.C.
J. Rathlesberger.
National Parks and Conservation Magazine, Vol 46, No 2, p 24-28, February 1972. 1 fig.

Descriptors: *Phosphates, *Algae, *Eutrophication, *Water pollution control, Federal government, Federal jurisdiction, Water quality, Water pollution sources, Great Lakes, Detergents.
Identifiers: *Federal Trade Commission, *Nixon Administration.

Phosphates, the cause of algae formations that hasten the process of eutrophication, have been removed from many detergents. In fact, phosphate detergents are banned in some states. The Nixon Administration has warned consumers on non-phosphate detergents and suggested that localities that have banned them reconsider what they have done. The tests have shown that some phosphate detergents have also been proved to be hazardous. The Federal Trade Commission's actions are stricter than those of the Administration's in the sense that the FTC requires that all phosphate detergents be labelled declaring the contents of phosphates and reminding the consumers of the polluting nature of the phosphates. The international agreement with Canada concerning the Great Lakes will force the Nixon Administration to reconsider its present policy which is the continuing use of phosphates. (Morparia-Texas)
W73-05021

LOSSES OF MERCURY FROM CHLORINE PLANTS: A REVIEW OF A POLLUTION PROBLEM,
Wisconsin Univ., Madison. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W73-05023

A STUDY ON DRINKING WATER IN VILLAGE RAHIMABAD OF LUCKNOW DISTRICT,
King George's Medical Coll., Lucknow (India). Dept. of Social and Preventive Medicine.
G. M. Dhar, B. G. Prasad, Y. D. Mathur, and J. K. Bhatnagar.
Indian J Med Res, Vol 59, No 12, p 1922-1931, 1971.
Identifiers: Bacteriological studies, Chemical analysis, Chlorides, Drinking water, *India, Lucknow, Nitrates, Pumps, Rahimabad, Water wells.

Rural drinking water in the village of Rahimabad, Lucknow was investigated. Fifty-one open shallow wells represented 87.93% of the total sources and shallow handpumps constituted only 12.07%. Of the total sources 89.65% were private. Of the wells, 78.44% did not have any cover, 23.52% had no parapets, 47.07% had no lining and 98.04% had no sanitary arrangement for drawing water. Cesspools, surface drains and refuse dumps which were considered as potential sources of pollution were present in 92.15% wells within 50 ft (15.24 meters) radius. Chemical analysis of water samples from the 51 open wells showed that excessive amounts of nitrites and nitrates were present in 46 and 43 wells, respectively. Chlorides were present in excessive amounts in all the wells. Bacteriological examination showed that the water was unsatisfactory as the Most Probable Number (MPN) index was over 180/100 ml of water examined. Only 7 handpumps were present in the village. The average yield per handpump ranged from 3.47 l-16.47 l/min. Chemical analysis of water from handpumps showed that nitrates and chlorides were in excess in all. Bacteriological examination of water samples obtained twice from each handpump at an interval of 1 mo. showed that only 2 samples had an MPN index above 10 and therefore bacteriologically the water of most of the handpumps was satisfactory.--Copyright 1972, Biological Abstracts, Inc.
W73-05079

BACTERIOLOGICAL FINDINGS IN THE CHLORINATED WATER SUPPLIES OF 1968 IN RANGOON,
Institute of Medicine I, Rangoon (Burma).
M. Tu, S. Hla-Gyaw, and H. Chen.
Union Burma J Life Sci, Vol 3, No 1, p 59-70, 1970, Illus.
Identifiers: Alcaligenes-Faecalis, *Bacteriological studies, Burma, *Chlorinated water supply, Citrobacter-Freundii, Clostridium-Perfringens, *Coliforms, Enterobacter, Enterococcus, Escherichia-Coli, Klebsiella-Aerogenes, Proteus-Fluroescens, Proteus-Vulgaris, Pseudomonas, *Rangoon, Serratia-Marcescens, Streptococcus-Fecalis.

Chlorinated waters from 20 sites in Rangoon were sampled and examined bacteriologically for coliforms enterococcis and Clostridium perfringens. Bacterial species obtained from primary MacConkey bile-salt lactose peptone water and sodium azide cultures were identified. Of a total of 26 samples tested, 22 were of unsatisfactory, and 1 of suspicious, bacterial sanitary quality. The remaining 3 samples should be considered satisfactory. The criteria used were the Presumptive Coliform Count, the Presumptive Enterococcus Count, and/or the isolation of Escherichia coli. The bacterial species isolated included E. coli, Klebsiella aerogenes, Citrobacter freundii, Streptococcus faecalis, Alcaligenes faecalis, and Enterobacter, Proteus and Pseudomonas spp. The viabilities of coliform species at 4 deg C extended up to 112 days in 2 E. coli and 3 K. aerogenes strains, and up to 56 days in 2 Enterobacter strains and 1 E. coli strain. In the noncoliform species tested 3 A. faecalis strains persisted till the 112th, and 1 P. aeruginosa strain, 2 P. fluorescens strains and 1 Serratia marcescens strain till the 56th day. None of 5 S. faecalis strains tested persisted till the 56th day. The viabilities of coliform species at room temperature extended up to 112 days in 2 E. coli and 5 K. aerogenes strains, and up to 56 days in 3 E. coli strains, 3 K. aerogenes strains, and 1 strain each of C. freundii and an Enterobacter species. In the noncoliform species tested, 1 Bacillus strain, 2 P. mirabilis strains, 2 P. aeruginosa strains and 1 P. fluorescens strain persisted till the 112th, and 2 A. faecalis strains, 1 Bacillus strain, 1 P. vulgaris strain, a Providence B strain and 4 P. fluorescens strains till the 56th day. None of 3 S. faecalis strains tested persisted till the 56th day.--Copyright 1972, Biological Abstracts, Inc.
W73-05082

WATER QUALITY AND PHYSICAL CHARACTERISTICS OF NEVADA TEST SITE WATER--SUPPLY WELLS,
Geological Survey, Lakewood, Colo.
H. C. Claassen.
Available from NTIS, Springfield, Va. 22151 as NTS-242, Price $3.00 printed copy; 95 cents microfiche. Geological Survey Report USGS-474-158, January 1973. 145 p, 29 fig, 34 tab, 18 ref. AEC Contract AT(29-2)-474.

Descriptors: *Water quality, *Physical properties, *Water wells, *Nuclear explosions, *Nevada, Water supply, Water pollution sources, Chemical analysis, Radiochemical analysis, Spectroscopy, Well data, Aquifer characteristics, Lithologic logs, Hydraulic properties, Data collections, Water yield, Drawdown, Water levels, Pumping.
Identifiers: *Nevada nuclear test site.

The U.S. Geological Survey has been obtaining water samples, measuring water levels, and performing aquifer tests on various wells and test holes at the Nevada Test Site since 1951. Some of these wells have been used to supply water for both human consumption and industrial supplies. Chemical, radiochemical, and hydraulic data obtained from the water-supply wells are presented. Time variations in these parameters are discussed and evaluated. A diagrammatic representation of well construction and lithology penetrated is included for each well. A section is devoted to each well and contains a description, attendant data tabulation, and data analysis. A resume indicating the suitability of the water for human consumption, according to Environmental Protection Agency guidelines (U.S. Public Health Service, 1962), is also presented. A list of reports containing information on the wells is included. (Woodard-USGS)
W73-05093

YEARLY AND DAILY ALTERATIONS OF O2 CONTENT IN SACROW-PARETZER CANAL AT POTSDAM AND THEIR RELATIONS TO ALTERATION IN OTHER FACTORS,
Wasserwirtschaftsdir ektion Havel, Potsdam (East Germany).
H. Klose, and D. Schaecke.
Limnologica, Vol 8, No 2, p 337-345. 1971. Illus.
Identifiers: *Photoperiodism, Alterations, Canals, Chlorophyll, Daily, Germany, *Dissolved oxygen, Plankton, Potsdam, Yearly, Sacrow-Paretzer Canal.

Dissolved O2 was determined by the Winkler method and chlorophyll content was determined. The maxima of plankton development are closely coordinated with the maximum of O2 content. The chlorophyll and O2 fell sharply at the end of Sept. Daily, the parameters increase until the afternoon and fall at night. This day-night rhythm is in relation to the total light radiation as is the seasonal alteration. These relations are disturbed by other factors at a station near the sewage outlet.--Copyright 1972, Biological Abstracts, Inc.
W73-05178

ORIGIN OF TRANSPIRATION WATER AND PATHWAYS OF HEAVY WATER (D2O) MOVEMENT IN LEAF TISSUES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii.
For primary bibliographic entry see Field 03F.
W73-05165

MAPPING OF LICHEN FREQUENCIES AS A TOOL IN EVALUATING INTENSITY OF POLLUTION, (IN GERMAN),
Freiburg Univ. (West Germany). Biochemisches Institut.
M. Kunze.
Oecologia (Berl). Vol 9, No 2, p 123-133, 1972, Illus, English summary.
Identifiers: Evernia-prunastri, Frequencies, Hypogymnia-physodes, Intensity, *Lichen, Mapping, Parmelia-dubia, Parmelia-sulcata, *Pollution intensity, Pseudevernia-furfuracea.

With previous methods of mapping lichen distribution, only a qualitative record of relatively great differences in the intensity of pollution is possible. By the following method of evaluating the frequency of the lichen species on individual trunks even very small differences in intensity of pollution can be detected, and quantitative gradation is possible. The lichens growing on the trunks of isolated trees surrounding factories or other polluters were investigated. A 'ladder' enclosing 10 panels is used to determine the frequency: the calculation is made electronically and permits statistical statements about the quantity of the lichen to be made. The numerical material evaluated consists of reproducible data obtained by a standardized method that appears to be suitable. for routine use. An example of the occurrence of some lichen species is the surroundings of a KCl mine. Zones can be recognized by changes in frequency of the variously sensitive species. The following species show increasing sensitivity to the pollution under consideration: Parmelia sulcata, P. dubia, Hypogymnia physodes, Evernia prunastri, Pseudevernia furfuracea.--Copyright 1972, Biological Abstracts, Inc.
W73-05168

THE SOURCES OF TRITIUM AND ITS RADIATION-HYGIENIC PROBLEMS,
Ustav Hygieny a Epidemiologie, Bratislava (Czechoslovakia).
J. Carach, and L. Cechvala.
Prac Lek. Vol 23, No 4, p 120-125, 1971.
Identifiers: Hygienic problems, *Radiation, *Tritium, Pollution sources.

The principal source of tritium in nature is the bombardment of atmospheric N-14 by secondary neutrons; the contribution from other sources is insignificant. Great quantities of tritium are generated by the testing of thermonuclear weapons, 0.7 kg H-3/megaton equivalent. Tritium is currently produced artifically by heavy water reactors. A heavy water reactor after 10 yr operation reaches an equilibrium of around 10 Ci/l D2O. The atmospheric emission is 2-3%/yr which amounts to several kg/day. Personnel working with tritium must be under medical supervision (urine tests). Air-tight rubber suits with good ventilation are the best protection against contamination. Around nuclear installations waste water, surface water and milk must be regularly tested for tritium.--Copyright 1972, Biological Abstracts, Inc.
W73-05170

CONTENT OF FREE FORMS OF MICROELEMENTS MANGANESE, COPPER, ZINC AND MOLYBDENUM IN FISH BREEDING PONDS IN THE MOSCOW OBLAST (IN RUSSIAN),
K. E. Galicheva.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prugovogo Tybn Khoz. 3, p 54-61. 1970. English summary.
Identifiers: Breeding ponds, Copper, *Trace elements, Fish, Manganese, Molybdenum, Moscow, Oblast, Ponds, USSR, Zinc.

Ponds which are located on different soils in the Moscow Oblast differ by their Mn, Cu, Zn and Mo

content.--Copyright 1972, Biological Abstracts, Inc.
W73-05185

THE SAPROBIOLOGICAL VALUE OF CERTAIN ELEMENTS OF LOTIC BIOCENOSES AS INDICATORS UNDER ROMANIAN CONDITIONS (IN RUMANIAN),
Bucharest Univ. (Rumania).
A. Mihaita.
An Univ Bucur Biol Anim. 20. p 83-88. 1971.
Identifiers: *Algae, Biocenoses, Elements, Indicators, Invertebrates, Jui River, *Lotic biocenoses, Protection, Rivers, Romania, *Saprobiological studies, Water pollution sources.

In water protection, verification of the biological indicators is an absolute necessity. Study of the benthic biocenoses of the Jui River and its tributaries allowed selection of 98 invertebrate and algal species as biological indicators of water quality. Of these, 38 were considered new indicators for the Jui River Basin.--Copyright 1972, Biological Abstracts, Inc.
W73-05187

COMPARATIVE INVESTIGATION OF THE ACCUMULATION OF RUBIDIUM, CESIUM, AND POTASSIUM BY ROACH AND PERCH UNDER NATURAL CONDITIONS (IN RUSSIAN),
Adademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
Y. P. Kanevskii, and D. G. Fleishman.
Ekologiya. Vol 2, No 2, p 10-14. 1971. Illus.
Identifiers: Accumulation, Cesium, Comparative studies, Perca-fluviatilis, *Perch, *Potassium, *Roach, Rubidium, Rutilus-rutilus.

The coefficients of accumulation of K and its microanalogs Rb and Cs in the muscle tissues of the roach (Rutilus rutilus) and perch (Perca fluviatilis) are inversely proportional to the K content in the water. The coefficients of discrimination of Rb and Cs are slightly higher for the perch than for the roach. No interrelation was found between the accumulation of Rb and Sc and Na.--Copyright 1971, Biological Abstracts, Inc.
W73-05188

5C. Effects of Pollution

NEMATODE COMMUNITY STRUCTURE, A TOOL FOR EVALUATING WATER RESOURCES ENVIRONMENTS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
V. R. Ferris, J. M. Ferris, and C. A. Callahan.
Available from the National Technical Information Service as PB-214 477, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No 30, 1972. 40 p, 9 fig, 12 tab, 34 ref. OWRR-A-015-IND (1), 14-31-0001-3514.

Descriptors: *Nematodes, *Biological communities, *Aquatic habitats, *Nitrites, Entomology, Water pollution sources, Sites, Ecology, Water pollution effects.
Identifiers: *Benthic nematodes, Stream habitats, Community structure.

Methods were developed in a two year study, by which nematode data on community structure from water research areas can be interpreted to lead to an increased understanding of ecological conditions. Nematodes were quantitatively sampled at intervals from 16 sites along two streams near West Lafayette, Indiana. Both streams flowed through farmland and some forested areas, and one also flowed through a growing housing development. Of 156 species of nematodes identified, 74 species were considered to be benthic inhabitants. Numbers of each species present at each sampling date at each site were obtained. Data for physico-chemical parameters were also collected at each of the 16 sites at biweekly intervals. These data included values for nitrate, nitrite, dissolved oxygen, carbon dioxide, pH, total hardness, phosphates, and water temperature. Organic matter and relative quantities of particles of different sizes were determined for the substrate of each site. The study indicates that analysis of benthic nematode community structure can be a useful tool for evaluating disturbances to aquatic habitats. Sufficient information for analysis can be obtained from data on a few of the dominant species.
W73-04556

THE EFFECTS OF PH, PHENOL, AND SODIUM CHLORIDE ON THE BIOENERGETICS OF LABORATORY POPULATIONS OF CHIRONOMUS ATTENUATUS,
Oklahoma Water Resources Research Inst., Stillwater.
J. Wilhm, and K. W. Thornton.
Available from the National Technical Information Service as PB-214 479, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, 1972. 16 p, 19 ref. OWRR A-032-OKLA (1).

Descriptors: *Dipterz, *Phenols, pH, *Sodium chloride, Energy budget, Lipids, Nitrogen compounds, *Hydrogen ion conentration, Water pollution effects.
Identifiers: Microcosms, *Chironomus attenuatus.

Continuous flow, laboratory microcosms were used to measure the effects of pH, phenol, and NaCl on the survival of the life stages of Chironomus attenuatus, the caloric content of third and fourth instar larvae and adults, the lipid and protein-nitrogen content of fourth instar larvae, and the interaction among the various responses. Each experiment consisted of 24 treatment combinations with a 3 x 4 x 2 factorial arrangement in a completely randomized design with two replications of each treatment. Treatment variables were pH at 6.2, 7.2, and 8.2; phenol at 0, 10, 20, and 30 mg/l; and NaCl at 0 and 600 mg/l. pH had a significant effect on the survival of all life stages of C. attenuatus. Increasing phenol levels resulted in a nearly linear increase in caloric content. Sodium chloride affected the lipid content of fourth instar larvae. The lipid content was higher with NaCl present in the media than without NaCl. Interaction had a significant effect on all responses except survival of third and fourth instar larvae.
W73-04560

METABOLIC ROLE OF SULFATES AND SULFIDES PRODUCING BACTERIA IN POLLUTION OF WATERS,
Kentucky Water Resources Inst., Lexington.
M. I. H. Aleem.
Available from the National Technical Information Service as PB-214 485, $3.00 in paper copy, $0.95 in miccrofiche. Research Report No 46, 1972. 52 p, 5 fig, 10 tab, 34 ref. OWRR A-016-KY (1), 14-01-0001-1636.

Descriptors: *Acid mine water, *Water pollution control, *Laboratory tests, *Bacteria, *Oxidation-reduction potential, *Sulfur bacteria, Iron bacteria, Nitrogen fixing bacteria, *Sulfates, *Sulfides, Analytical techniques, Chemical reactions.
Identifiers: Chemoautotrophic bacteria.

Since the activities of sulfur bacteria are known to be responsible for many of the characteristics of acid-mine wastes, investigations were aimed at elucidating the physiology and metabolism of these bacteria as this approach appears to be the key to the development of control measures. The investigations show that thiobacilli are the most prolific producers of sulfates from the oxidation of sulfur compounds. Under laboratory conditions, an average population of thiobacilli approximates 10 to the eighth power cell/cc (or 0.075 mg dry weight) in a growth medium. The rate of sulfate production was in the order of 10 to 40 micromoles/hr/mg dry wt. of cells. Assuming that the rate of sulfur transformation in natural environments having enrichment of these organisms is approximately 10% of the transformations observed under laboratory conditions, then the thiobacilli could produce as much as 100 to 400 moles of sulfates in one hour in the upper 1-foot of water in an area of one acre. Such a high level of sulfate production poses a serious environmental threat. Concentrations as low as 0.000001 to 10 to the minus seventh power of chloro or bromo-substituted phenols are effective in the complete inhibition of the energy metabolism of thiobacilli. This could be useful in designing experiments to control sulfate production by the sulfur oxidizing bacteria. (Woodward-USGS)
W73-04567

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS: I. RIVERS,
Water Pollution Research Lab., Stevenage (England).
A. L. Downing.
Int J Environ Stud. Vol 2, No 2, p 101-110, 1971. Illus.
Identifiers: *Water pollution effects, Discharges, *Forecasting, *Rivers.

Methods used to predict the effects of polluting discharges on rivers are described. The shortcomings of the methods at present available are discussed, and possible ways in which these may be modified are outlined. The simple mass balance of pollutants is considered first, and examples are given of situations in which this technique can be usefully employed. The prediction of the behavior of discharges of conservative substances is then described and extended from the calculation of average concentrations to the consideration of probable variations in concentration. The additional complications involved when considering the more usual situation where the discharge contains non-conservative substances are outlined, and the difficulties inherent in the prediction of dissolved-O2 concentration are described. Finally the problems of accidental and intermittent discharges are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-04606

TOXICOLOGICAL ASPECTS OF MARINE POLLUTION,
World Life Research Inst., Colton, Calif. International Biotoxicological Center.
Bruce W. Halstead.
Effluent and Waste Treatment Journal, Vol 11, No 12, p 671-673, December 1971.

Descriptors: Water pollution sources, *Chemical wastes, *Toxicity, *Toxins, *Water pollution effects, *Ecosystems, Environmental effects, Marine animals, Marine plants, Aquatic life.
Identifiers: *Marine biotoxins.

Most chemical pollution problems are toxicological. Toxic effects on living organisms may be acute, dramatic, short term, and easily discernible yet correction of the cause may be difficult, costly and long-term. Some of the most difficult problems in the marine ecosystem are associated with chronic intoxications that are long-term and have low-level effects which can result in a tremendous build-up of toxic constituents in the environment and destruction before they are even detected. The naturally-occurring marine biotoxins are outlined and some of the overall toxicological aspects of the problem are discussed. (Ensign-PAI)
W73-04610

PRELIMINARY RESULTS OF MARINE PATHOLOGY STUDY OFF THE FLORIDA COAST,
Hawaii Univ., Hilo. Div. of Natural Science.
A. C. Smith, and R. L. Taylor.
Marine Technology Society Journal, Vol 6, No 3, p 51-52, May-June, 1972. 1 ref.

Descriptors: *Florida, *Coastal areas, *Animal pathology, *Marine biology, *Invertebrates, Fish, *Mullusks, Oceans, Pollutants.
Identifiers: *Natural pathology profiles, *Porifera, *Coelenterates, *Arthropods, *Echinoderms, *Protochordates.

The preliminary results of a marine pathology survey of the southwest coast of Florida (from Ft. Myers to Key West) are presented. Seventy-six pathological specimens, both invertebrate and vertebrate, were collected; the findings are briefly presented under various animal groupings including/porifera, coelenterates, molluscs and fishes. The purpose was to investigate the pathology in an unpolluted coastal area which was influenced by the open sea. The survey results indicate that injury, disease and abnormality in marine animals is not uncommon, that there is a relatively high natural incidence of pathology in the area studied, and that 'profiles of natural pathology' should be established for use in assessing the subsequent pollution in coastal areas. (Ensign-PAI)
W73-04616

THERMAL DISCHARGES INTO THE COASTAL WATERS OF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05B.
W73-04619

ENVIRONMENTAL EFFECTS OF OIL POLLUTION IN CANADA, AN EVALUATION OF PROBLEMS AND RESEARCH NEEDS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
R. E. Warner.
A brief prepared for the Canadian Wildlife Service, August 14, 1969. 31 p, 38 ref.

Descriptors: *Canada, Oil, *Oil pollution, Water pollution, *Coasts, Ships, *Drilling, *Exploration, *Exploitation, Research and development, Biology, Oceanography, Environmental effects, Pollutant identification, Monitoring, Standards, Governments.
Identifiers: Canadian Arctic, Hudson Bay, Northwest Passage.

The coastal regions of Canada are suffering a serious biological problem caused by years of dumping of oil at sea by tankers and other vessels and the more recent offshore drilling in the Canadian Arctic with plans for exploitation in Hudson Bay. Adding to the high risk of environmental contamination is the proposed use of the Northwest Passage as an oil shipping route. Recommendations to this problem are: a biologically and oceanographically oriented research program in the North Atlantic and coastal regions of eastern Canada; research into the biological effects of marine oil pollution upon the hyponeuston which is so important to the continued productivity of the oceans; research into the biological effects of oils in arctic and subarctic waters; a survey to identify sites for critical area protection programs; research on the biological effects of refinery and petrochemical plant operations; a national system for locating, reporting, and identifying oil pollution sources; development of a national contingency program; development of a national criteria for environmental protection to be included in leases and contracts; and improvement of international coordination and communication. (Ensign-PAI)
W73-04620

ARTIFICIAL RADIOACTIVITY OF SOME HYDROBIONTS OF THE SOUTHERN OCEAN (SCOTIA SEA),
V. N. Tkachenko, and S. A. Patin.
Oceanology, Vol 11, No 4, p 594-598, 1971. 1 fig, 1 tab, 22 ref.

Descriptors: *Radioactive wastes, *Fallout, *Antarctic Ocean, *Bioindicators, Marine biology, Spectrometers, Nuclear explosions, Transport, Sea water.
Identifiers: *Scotia Sea, *Antarctic krill, *Gamma-spectrometry, *Hydrobionts, Zirconium, Niobium, Ruthenium, Rhodium, Cesium.

Investigations of radioactive accumulation in marine organisms of Antarctic waters were conducted in order to gain background information on the characteristics of present-day global pollution by radioactive products. Gamma-spectrometry was used to determine the levels of artificial radionuclides in hydrobionts collected from the Scotia Sea from January 1967 to March 1968. Zirconium-95--niobium-95, ruthenium-106--rhodium-106, and cesium-137 were identified and determined quantitatively in several samples, particularly antarctic krill. Investigations indicated that these radionuclides were most likely of atmospheric origin and were the result of nuclear explosions. It was further determined that the noticeable amounts of fission products in krill made it possible to use this hydrobiont as an indicator for detecting the gamma-emitters in question in the photic layer of antarctic water masses. (Ensign-PAI)
W73-04622

POPULATION DYNAMICS OF POND ZOOPLANKTON, I. DIAPTOMUS PALLIDUS HERRICK,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02H.
W73-04637

POPULATION DYNAMICS OF POND ZOOPLANKTON, II. DAPHNIA AMBIGUA SCOURFIELD,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02H.
W73-04638

NERVE GAS-ISOPROPYL METHYLPHOSPHONOFLUORIDATE (GB)--DECOMPOSITION AND HYDROSTATIC PRESSURE ON THE OCEAN FLOOR,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B.
W73-04650

INHIBITION OF MITOCHONDRIAL ELECTRON TRANSPORT BY GUTHION, SOME RELATED INSECTICIDES, AND DEGRADATIVE PRODUCTS,
Nevada Univ., Reno. Div. of Biochemistry.
J. C. Heidker, and R. S. Pardini.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 3, p 141-146, September 1972. 1 fig, 2 tab, 9 ref.

Descriptors: *Bioassay, *Pesticide toxicity, Enzymes, Organic acids, Organophosphorus pesticides, Inhibitors.
Identifiers: *Guthion, *Ethyl guthion, *Dylox, *Di-syston, *Electron transport, Benzsazimide, Anthranilic acid, Metabolites, Mitochondria.

Heavy beef heart mitochondria (HBHM) were used to investigate the chronic effects of guthion and its metabolic desulfuration and photoinduced breakdown products on electron transport. The pesticides and electron transport carriers were added in ethanol or water. The results show that ethyl guthion, guthion, ethyl guthion oxygen analog, and guthion oxygen analog depressed the mitochondrial NADH-oxidase enzyme system at concentrations of 138.9 and 1389 nanomoles of pesticide per mg of mitochondrial protein. Benzazimide and anthranilic acid were noninhibitory. It was concluded that none of the guthion derivatives or breakdown products tested was inhibitory to the mitochondrial succinoxidase system. Since ethyl guthion and guthion were the most potent inhibitors of the NADH-oxidase system, it is suggested that the phosphorodithioate structure may be important in this inhibition. (Little-Battelle)
W73-04652

ALGAL POPULATIONS IN ARCTIC SEA ICE: AN INVESTIGATION OF HETEROTROPHY,
Alaska Univ., College. Inst. of Marine Science.
R. Horner, and V. Alexander.
Limnology and Oceanography, Vol 17, No 3, p 454-458, May 1972. 2 fig, 13 ref.

Descriptors: *Ice, *Arctic Ocean, *Marine algae, *Sea ice, Protozoa, Metabolism, Chrysophyta, Pyrrophyta, Marine bacteria, Euglenophyta, Chlorophyta, Plant populations, Absorption, Sampling, Core drilling, Diatoms, Dinoflagellates, Pollutant identification.
Identifiers: *Heterotropy, Heterotrophic nutrition, Cryptomonads, Light microscopy, Dissolved organic matter, Assimilation, Nitzschia frigida, Amphiprora hyperborea, Fragilariopsis oceanica, Nitzschia closterium, Pleurosigma stuxbergii, Gomphonema exiguum, Navicula, Peridinium, Dinema litorale, Eutreptiella, Platymonas, Stylonychia, Euplotes, Autoradiographs.

The population composition, metabolism and heterotrophy problem of arctic sea ice algae are described. Samples of sea ice were taken (organisms occur as a brown layer, 2-3 cm thick on the underside of year-old sea ice) with corers. Three sections about 15 cm long were taken from the top, middle, and bottom of the core and allowed to melt at temperatures of 8-10 C or 15-20 C. Microscopic examination of melting ice showed that salinity changes caused no physical damage to the organisms but rapid temperature increases during examination caused the flagellates to disintegrate. Tracer kinetic experiments were carried out according to the method of Wright and Hobbie (1965). Complex algal populations in the bottom few centimeters of arctic sea ice were accompanied by bacteria, protozoans, and other organisms. Community uptake of dissolved organic substances, assayed with C-14-glycine, C-14-glucose, and H-3-acetate was slow. Microscopic examination of autoradiographs suggests that heterotrophic metabolism by the algae was negligible and that assimilation of the added substrate was almost exclusively by bacteria. (Byrd-Battelle)
W73-04653

GROWTH INTERACTIONS BETWEEN CHLAMYDOMONAS GLOBOSA SNOW AND CHLOROCOCCUM ELLIPSOIDEUM DEASON AND BOLD: THE ROLE OF EXTRACELLULAR PRODUCTS,
Nijmegen Univ. (Netherlands). Botany Lab.
H. W. Kroes.
Limnology and Oceanography, Vol 17, No 3, p 423-432, May 1972. 6 fig, 35 ref.

Descriptors: *Cultures, *Growth rates, *Environmental effects, Competition, Aquatic plants, Proteins, Phenols, Lipids, Carbohydrates, Aquatic algae, Organic acids, Organic compounds, Chlorophyta, Separation techniques, Solvent extractions, Freeze drying, Membrane processes, Filtration.
Identifiers: *Chlorococcus ellipsoideum, *Chlamydomonas globosa, *Growth interactions,

Polysaccharides, Sample preparation, Extracellular substances, Metabolites, Ultrafiltration, Carboxylic acids, Fatty acids.

Extracellular substances were isolated from Chlorococcum culture filtrates and the four salt-free groups of substances obtained tested separately on Chlamydomonas growth. The extracellular substances were separated by a combination of freeze-drying and solvent extraction-evaporation techniques coupled with water distillation for steam volatile substances, ether extraction-evaporation for lipophilic substances, and column separation-colorimetry for separation of water soluble pigment substances. For separation of higher molecular weight substances the filtrate was not freeze dried but subjected to ultrafiltration and a membrane-pressure process. The group of steam-volatile substances had an overall promoting effect. The lipophilic group inhibited growth initially but had no lasting effect. The yellow, water-soluble pigments (phenolic compounds) could act as chelating substances. The high molecular weight fraction (proteins and polysaccharides) promoted growth in the initial phase but had an inhibiting effect later on. These effects observed were mostly small but statistically signigicant. In algal interactions, inhibition phenomena are not likely to be caused by strong 'antibiotic' substances. Factors such as pH may be more important than extracellular compounds as such. (Mackan-Battelle)
W73-04657

LIFE CYCLE AND SEASONAL ABUNDANCE OF THE COPEPOD LIMNOCALANUS MACRURUS SARS IN A HIGH ARCTIC LAKE,
Guelph Univ. (Ontario). Dept. of Zoology.
J. C. Roff, and J. C. H. Carter.
Limnology and Oceanography, Vol 17, No 3, p 363-370, May 1972. 4 fig, 1 tab, 16 ref.

Descriptors: *Biomass, *Life cycles, *Copepods, *Seasonal, *Secondary productivity, Animal populations, Zooplankton, Crustaceans, Primary productivity, Environmental effects, Biological communities, Arctic, Water temperature, Aquatic animals.
Identifiers: *Limnocalanus macrurus, *Population density, Char Lake, Stenothermal.

The population structure, life cycle, and abundance of the copepod Limnocalanus macrurus, one of the two multicellular zooplanktonic species in Char Lake, Northwest Territories, has been studied for 18 months. The population is univoltine, taking about 9 months to develop from egg to adult. Total population density was lower in 1970 than in 1969, whereas the phytoplankton biomass and productivity were virtually identical in both years. The life cycle of L. macrurus was very similar in both years of study and also showed close similarity to that of a southern Ontario population. (Holoman-Battelle)
W73-04661

PHTHALATE EFFECT ON HEALTH STILL NOT CLEAR.

Chemical and Engineering News, Vol 50, No 38, p 14-15, September 18, 1972.

Descriptors: *Water pollution effects, *Public health, *Toxicity, Chemical analysis, Gas chromatography, Mass spectrometry, Mississippi River, Fish, Bioassay, Animal pathology, Water pollution sources, Soil contamination, Vegetation, Water analysis.
Identifiers: *Phthalate, Phthalic acid, Plasticizers, Continuous flow centrifugation, Charles River, Liquid solid chromatography, Phthalate esters, Crude oil, Rats, Di- (2-ethylhexyl) phthalate.

A review is presented of medical research on the effects of phthalate on health. Animal studies have shown phthalic acid esters (PAE) are relatively inert and generally have a low order of chronic toxicity. Human ingestions of the most widely used PAE, di- (2-ethylhexyl) phthalate (DEHP), have resulted in symptoms of nausea and vertigo. Analysis of patients who have been treated with blood stored in blood bags made out of DEHP revealed significant quantities of the plasticizer in the spleen, lung, liver, and abdominal fat; research by others has confirmed these results as well as the absence of PAE's, as determined by gas chromatography-mass spectrometry, in the blood of normal volunteers who have not undergone transfusion. More recent research has shown that 98 percent of DEHP accumulated in liquid stored whole blood can be washed out with continuous-flow centrifugation. PAE's have also been detected in rivers, such as in the Charles River, where a total phthalate concentration of 0.9 - 1.9 ppb was found employing high-pressure liquid-solid chromatography. DEHP residue levels from 0.2 to 10.0 micrograms per gram (whole fish basis) have been detected in fish from various locations, with the higher levels associated with industralized areas. Embryo-fetal toxicity was manifested in fetal malformations in rats given intraperitoneal doses in varying amounts of the six least toxic PAE compounds. Naturally occurring sources of the phthalate moiety include cigar smoke, tobacco leaves, grapes, cranberries, poppies, oxidized corn oil, soil, and crude oil. The significance for man of these toxicological results is still largely unknown. The use of substitute materials where possible for the plasticizer is highly recommended. (Byrd-Battelle)
W73-04668

RESIDUES OF DDT AND ITS DEGRADATION PRODUCTS IN COD LIVER FROM TWO NORWEGIAN FJORDS,
Statens Plantevern, Vollebekk (Norway).
J. Stenersen, and J. Kvalvag.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 120-121, August 1972. 1 fig, 1 tab, 3 ref.

Descriptors: *Fish, *Pesticide residues, *DDT, *DDD, *DDE, *Gas chromatography, *Path of pollutants, *Absorption, Pesticides, Chlorinated hydrocarbon residues, Chromatography, Analytical techniques, Contamination, Orchards, Spraying, Water pollution sources, Water pollution effects.
Identifiers: Cod, Liver, Bioaccumulation, Metabolites, Biological samples, Norway, Chlorinated hydrocarbons.

Since fruit orchards along fjords of the Norwegian West Coast are frequently sprayed with DDT, cod were caught from Sognefjorden, where there is intensive fruit production, and from Dalsfjorden, with no fruit growing, to determine whether spraying leads to residues in aquatic biota. The cod were caught in 1969 and frozen until analysis by gas chromatography. Quantitative separation of DDD and DDT was obtained on a 11 percent (QF-1 plus OV-17) GLC-column and results were confirmed by dehydrochlorination. The analyses show that residues in livers of cod taken from Sognefjorden contained an average of 5.05 ppm DDT, 2.67 ppm DDE, and 1.85 ppm DDD. These concentrations averaged about 7.5 times those of cod from Dolsfjorden. It is concluded that local spraying with DDT has contaminated the aquatic biota. (Little-Battelle)
W73-04669

THE EFFECT OF INCREASED TEMPERATURE UPON THE ACUTE TOXICITY OF SOME HEAVY METAL IONS,
Marist Coll. Poughkeepsie, N.Y. Environmental Science Program.
R. Rehwoldt, L. W. Menapace, B. Nerrie, and D. Alessandrello.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 2, p 91-96, August 1972. 4 tab, 9 ref.

Descriptors: *Fish, *Thermal pollution, *Toxicity, *Bioassay, *Heavy metals, *Water temperature, Copper, Zinc, Nickel, Mercury, Cadmium, Chromium, Lethal limit, Water pollutioneffects, Ions, White perch, Eels, Carp, Freshwater fish, Sunfishes, Bass, Killifishes.
Identifiers: Striped bass, Banded killifish, Fundulus diaphanus, Roccus saxatilis, Lepomis gibbosus, Roccus americanus, Anguilla rostrata, Cyprinus carpio, Biological samples.

Banded killifish, striped bass, pumpkinseed, white perch, American eel, and carp were exposed at 28 C to Cu, Zn, Ni, Cd, Hg, and Cr ions to determine the mean toxicity limit for 50 percent survival (TL sub m). The 28 C temperature was chosen because it represents the ambient temperature of the thermal plume of the Danskammer Point power station in the town of Newburgh, New York. Water temperature in test tanks was maintained by standard aquarium heaters. Toxicity data are tabulated for 24, 48, and 96 hours in terms of metal ion concentration and also relative to existing ambient background concentrations in the river during the course of the investigation. The latter data show the magnitude of change that would have to occur in the receiving water to produce a fish kill. Comparison of the TL sub m values at 28 C with data from tests at 15 C shows that toxicities at the two temperatures are not significantly different except with mercurous ions. For carp-like fish it was concluded that mercurous ion toxicity was about three-fold for a 10 C increase in temperature. (Little-Battelle)
W73-04672

CORRECTION FOR LAG IN CONTINUOUS--FLOW RESPIROMETRY,
Toronto Univ. (Ontario). Dept. of Zoology.
D. O. Evans.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1214-1216, August 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Metabolism, *Respiration, *Rainbow trout, Oxygen, Equations, Water temperature, Water pollution effects, Methodology, Dissolved oxygen, Fluctuations, Fish physiology.
Identifiers: *Continuous flow respirometry, *Correction factor, Salmo gairdneri.

The lag and damping effect caused by fluctuations in the oxygen content of the respiration chamber in continuous-flow respirometry can be eliminated by addition of the simple correction factor (chamber volume x initial-final outflow oxygen concentration) to the ordinarily used formula (flow x mean difference between inflow and outflow oxygen concentration). Metabolism data for six rainbow trout, Salmo gairdneri, are presented. (Byrd-Battelle)
W73-04676

ACIDIFICATION OF THE LA CLOCHE MOUNTAIN LAKES, ONTARIO, AND RESULTING FISH MORTALITIES,
Toronto Univ. (Ontario). Dept. of Zoology.
R. J. Beamish, and H. H. Harvey.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1131-1143, August 1972. 3 fig, 6 tab, 34 ref.

Descriptors: *Freshwater fish, *Acidity, *Mortality, *Lakes, *Water pollution effects, Canada, Lake trout, Cisco, Suckers, Hydrogen ion concentration, Oligotrophy, Chemical analysis, Physicochemical properties, Water analysis, Water pollution sources, Monitoring, Yellow perch, Sculpins, Turbidity, Color, Suspended solids, Dissolved solids, Hardness (Water), Alkalinity, Iron, Sulfates, Chlorides, Phosphorus,

Nitrates, Nitrites, Sodium, Potassium, Calcium, Magnesium, Aluminum, Silica, Biochemical oxygen demand, Fishkill, Path of pollutants.
Identifiers: *La Cloche Mountains, Lumsden Lake, Burbot, Catostomus commersoni, Salvelinus namaycush, Coregonus artedii, Perca flavescens, Lota lota, Cottus cognatus, Percopsis omiscomaycus, Hybopsis plumbeus, Sulfites.

The loss of populations of lake trout (Salvelinus namaycush), lake herring (Coregonus artedii), white suckers (Catostomus commersoni), and other fishes in Lumsden Lake was attributed to increasing levels of acidity within the lake. An absence of fishes was also observed in nearby lakes. In some lakes, acid levels have increased more than one hundredfold in the last decade. The increases in acidity appear to result from acid fallout in rain and snow. The largest single source of this acid was considered to be the sulfur dioxide emitted by the metal smelters of Sudbury, Ontario. In 1971, pH measurements were taken from 150 lakes in the general study area 65 km southwest of Sudbury. Some 33 of these lakes showed a pH of less than 4.5 and were described as 'critically acidic'. An additional 37 lakes had a pH in the range of 4.5-5.5 and were termed 'endangered' lakes. (Holoman-Battelle)
W73-04679

EFFECT OF INTERTIDAL EXPOSURE ON SURVIVAL AND EMBRYONIC DEVELOPMENT OF PACIFIC HERRING SPAWN,
British Columbia Univ., Vancouver. Dept. of Zoology.
B. C. Jones.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1119-1124, August 1972. 6 fig, 8 ref.

Descriptors: *Intertidal areas, *Embryonic growth stage, Herrings, Fish eggs, Mortality, Air, Larval growth stage, Size, Length, Bioassay.
Identifiers: *Survival, *Pacific herring, *Intertidal exposure, Clupea pallasii.

In a study which sought to determine the effects on Pacific herring spawn of regular tidal exposure to air, the following variables were examined: prehatching mortality, incubation time, larval and weight at hatching in relation to varying degrees of exposure, effects of egg size (dry weight), fish size, and clump size. Beach surveys were also undertaken to note possible egg size stratification. The eggs were exposed to air for different periods of time to simulate tidal effects on spawn deposits at varying beach heights on the British Columbia coast. Prehatching mortality changed from 13 percent unexposed to 31 percent at 8-hr exposure twice daily. Significantly higher mortality occurred among eggs of smaller fish and eggs in smaller clumps. Incubation time decreased from 19.2 to 18.2 days with 2-hr exposure twice per day, and thereafter declined 0.4 days with greatest exposure. Larval length at hatching for unexposed eggs was 7.7 mm; lengths for all degrees of exposure were similar (7.2 mm). Larval weight was greatest (0.099 mg) for eggs exposed between 4 and 6 hr twice per day, decreasing with either greater submergence or exposure (7 and 12 percent respectively). Hypoxia, desiccation, and the air-water temperature differential are considered as possible causal agents. A field survey indicated that deposition of larger eggs occurred at upper beach levels. These results suggest that a high fishing intensity could detrimentally affect future spawn and thereby reduce population recruitment. (Holoman-Battelle)
W73-04682

EFFECTS OF TEMPERATURE ON GROWTH AND SURVIVAL OF YOUNG BROOK TROUT, SALVELINUS FONTINALIS,
National Water Quality Lab., Duluth, Minn.
J. H. McCormick, K. E. F. Hokanson, and B. R. Jones.
Journal of the Fisheries Research Board of Canada, Vol 29, No 8, p 1107-1112, August 1972. 1 fig, 2 tab, 24 ref.

Descriptors: *Water temperature, *Environmental effects, *Fish physiology, *Physiological ecology, *Fry, Thermal stress, Brook trout, Biomass, Mortality, Growth rates, Growth chambers, Thermal pollution, Bioassay.
Identifiers: *Salvelinus fontinalis, Survival, Thermal tolerance, Acclimatization.

Instantaneous rates of growth, mortality, and net biomass gain were determined for alevin through juvenile brook trout reared for 8 weeks at six constant temperatures: 7.1, 9.8, 12.4, 15.4, 17.9, and 19.5 C. The test system provided a continuous flow of Lake Superior chlorine- and ammonia-treated water at about 250 ml/min at a constant temperature to duplicate test chambers. Water temperatures were monitored with constant-recording telethermometers and were measured daily in each chamber to the nearest 0.1 C with a Hg thermometer. Growth rates were maximum between 12.4 and 15.4 C. Mortality rates increased between 15.4 and 17.9 C and were maximum between 17.9 and 19.5 C. The net rates of biomass gain were maximum between 12.4 and 15.4 C. Median upper thermal tolerance limits (TL 50 values) were determined for newly hatched and swim-up alevins. Tolerance did not increase in newly hatched alevins with acclimation to temperatures from 2.5 to 12 C. The upper 7-day TL50 for newly hatched alevins acclimated over this range of temperatures was 20.1 C. The swim-up alevins showed both an increase in temperature tolerance with acclimation temperatures between 7.5 and 12 C and an increase in tolerance over that of the newly hatched alevins at comparable acclimation temperatures. The ultimate 7-day TL50 of swim-up alevins was 24.5 C. Swim-up alevins exeed newly hatched alevins in thermal tolerance by 2.0-4.5 C, depending on the temperature of acclimation. The TL50 of newly hatched alevins of comparable acclimation (12 C) is reduced by about 2 C when the exposure time is increased from 1 to 7 days. (Little-Battelle)
W73-04683

A FIVE-MINUTE SOLUTION FOR STREAM ASSIMILATIVE CAPACITY,
Rice Univ., Houston, Tex.
For primary bibliographic entry see Field 05G.
W73-04697

TEMPERATURE EFFECTS ON GROWTH AND YIELD OF ACTIVATED SLUDGE,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
A. A. Friedman, and E. D. Schroeder.
Journal Water Pollution Control Federation, Vol 44, No 7, p 1433-1442, July 1972. 8 fig, 3 tab, 25 ref.

Descriptors: *Activated sludge, *Temperature, *Growth rates, Cytological studies, Biochemical oxygen demands, Suspended solids, Wastewater treatment, Mathematical studies, Flow rates, Volumetric analysis, Analytical techniques, Filtration, Carbon, Dissolved oxygen, Hydrogen ion concentration.
Identifiers: Arrhenius equation, Continuous-flow stirred-tank reactor, Cell yield.

Data were obtained from experiments performed with a continuous-flow stirred-tank reactor (CFSTR) to study the effects of temperature on the activated sludge process. Net growth rate and the sludge yield coefficient were determined by measuring the eight process parameters and applying mathematical equations. Volumetric measurements of flow rate were made and suspended solids were determined by filtration. The total organic carbon from these filtration tests was measured to determine substrate concentrations. Reactor temperature, DO, and pH were also determined. It was concluded that temperature effects are important and should be considered in process design but that the Arrhenius equation cannot be used to describe these effects. In this prototype system maximum growth rate and cell yield occurred at 20C. It was also concluded that BOD removal effects as a result of temperature are not observed the reason may be excess reaction capacity or overdesign of the process. (Mortland-Battelle)
W73-04698

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
S. K. Banerji.
Journal Water Pollution Control Federation, Vol 44, No 6, p 944-948, June 1972. 28 ref.

Descriptors: *Detergents, *Reviews, *Eutrophication, Phosphates, Lakes, Nutrients, Waste water treatment, Water quality standards, Algae, Nitrolotriacetic acid, Activated sludge, Taste, Odor, Surfactants, Alkylbenzene sulfonates, Ion exchange, Biodegradation, Toxicity, Water pollution effects, Aquatic life, Water quality, Linear alkylate sulfonates, E. coli, Bioindicators, Organic wastes, Alcohols, Phosphorus, Coagulation, Sedimentation, Cations, Dissolved oxygen, Metals, Mississippi River, Fish, Crustaceans, Clams, Worms, Yeasts, Carbon, Oxidation, Bibliographies, Water pollution effects.
Identifiers: Lake Constance, Coastal waters, Sodium alkyl monosulfate, Scolalopis fulginose, Capitella capitota, Mytilus galloprovincialis, Hansenula, Candida, Candida krusci, Hansenula california, Dodecylbenzene sulfonate.

Literature related to the role of detergents in water quality and lake eutrophication is briefly reviewed. The effects, treatment, and biodegradability of phosphates, NTA, ABS, LAS, and alcohol sulfates are discussed along with the toxicity of various detergents to aquatic life including fish, crustaceans, worms, and yeasts. (Mortland-Battelle)
W73-04700

CADMIUM UPTAKE BY MARINE ORGANISMS,
National Marine Water Quality Lab., West Kingston, R.I.
R. Eisler, G. E. Zaroogian, and R. J. Hennekey.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1367-1369, September 1972. 1 tab, 5 ref.

Descriptors: *Cadmium, *Food chains, *Oysters, *Lobsters, Absorption, Heavy metals, Water pollution effects, Bioassay, Public health, Clams, Mollusks, Path of pollutants, Foods.
Identifiers: *Biological magnification, *Atomic absorption spectrophotometry, *Mummichogs, *Scallops, Biological samples, Sample preparation, Macroinvertebrates, Dry ashing, Fundulus heteroclitus, Aquipecten irradians, Crassostrea virginica, Tissue, Homarus americanus, Muscle, Viscera, Gills.

Adults of mummichog, Fundulus heteroclitus, scallop Aquipecten irradians, oyster Crassostrea virginica, and subadult lobsters Homarus americanus were immersed for 21 days in flowing sea water containing 10 micrograms/liter of cadmium as CdC12.2-1/2 H2O. After exposure of the animals, 16 pooled tissue samples were prepared, 8 experimental and 8 control. Samples were (1) whole mummichog, (2) whole oyster meats, (3) scallop adductor muscle, (4) scallop remaining soft parts, (5) lobster muscle from abdomen and claws, (6) lobster gill, (7) lobster viscera and (8) lobster remainder. Sample preparation involved dry ashing and digestion in 6 N HCl. Analysis was by atomic absorption spectroscopy. Cadmium residues in whole animals and selected tissues were consistently higher in exposed organisms

than controls; edible portions of treated lobster (muscle), scallop (adductor muscle), and oyster (whole animal) contained more cadmium per unit wet weight than controls by 25 percent, 19 percent, and 352 percent, respectively. Therefore, Cd concentrations in water not previously considered hazardous may, by man's ingestion of sea foods, prove to be hazardous. (Little-Battelle)
W73-04702

BUNKER C OIL IN SEDIMENTS AND BENTHIC ANIMALS FROM SHALLOW DEPTHS IN CHEDABUCTO BAY, N.S.,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 05B.
W73-04703

EFFECT OF TWO IODOPHORS ON BACTERIAL AND FUNGAL FISH PATHOGENS,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
A. J. Ross, and C. A. Smith.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1359-1361, September 1972. 2 tab, 4 ref.

Descriptors: *Bioassay, *Pathogenic bacteria, *Fungi, *Toxicity, Lethal limit, Organic compounds, Iodine, Cultures.
Identifiers: *Betadine, *Wescodyne, *Iodine compounds, Redmouth bacterium, Aeromonas salmonicida, Aeromonas liquefaciens, Vibro anquillarium, Cytophaga psychrophila, Chondrococcus columnaris, Corynebacterium, Phoma herbarum, Saprolegnia parasitica.

In in vitro tests on nine species of bacteria (Aeromonas salmonicida, A. liquefaciens, Vibrio anquillarum, Cytophaga psychrophila, Chondrococcus columnaris, redmouth bacterium, fluorescent and nonfluorescent pseudomonads and Corynebacterium sp) and two species fungi (Phoma herbarum and Saprolegnia parasitica), the majority of strains tested did not survive a 5-min exposure to either Betadine or Wescodyne at a concentration of 25 ppm active ingredient. (Little-Battelle)
W73-04704

BLOOD CONCENTRATIONS OF TRICAINE METHANE SULPHONATE IN BROOK TROUT, SALVELINUS FONTINALIS, DURING ANESTHETIZATION, BRANCHIAL IRRIGATION, AND RECOVERY,
Medical Coll. of Wisconsin, Milwaukee.
A. H. Houston, and R. J. Woods.
Journal Fisheries Research Board of Canada, Vol 29, No 9, p 1344-1346, September 1972. 1 tab, 8 ref.

Descriptors: *Brook trout, *Bioassay, *Fish behavior, *Toxicity, Water pollution effects, Fish, Fish physiology.
Identifiers: *Tricaine methane sulfonate, Anesthetics, Salvelinus fontinalis, Blood, Biological samples, Drugs.

Blood concentrations of tricaine methane sulphonate increased rapidly upon immersion of trout in 100 mg/liter solutions of the anesthetic at 3.5-5 C, and also rose significantly during irrigation for 15 min with either 50 or 100 mg/liter solutions. Clearance was rapid following transfer to running freshwater recovery tanks. Graphical estimates of 50 and 90 percent blood clearance times were 20 and 55 min, respectively. (Little-Battelle)
W73-04705

EFFECTS OF EXPOSURE TO SUBLETHAL DDT ON THE LOCOMOTOR BEHAVIOR OF THE GOLDFISH (CARASSIUS AURATUS),
Texas A and M Univ., College Station. Inst. of Life Science.
F. B. Davy, and H. Kleerekoper.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1333-1336, September 1972. 2 tab, 23 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Movement, *Fish behavior, Water pollution effects, Water analysis, Chemical analysis, Fish physiology, Carbonates, Bicarbonates, Water properties, Chlorides, Sulfates, Silica, Calcium, Magnesium, Sodium, Hardness (Water), Copper, Zinc, Conductivity.
Identifiers: *Goldfish, *Carassius auratus.

Effects are reported of chronic exposure to sublethal doses of DDT on the locomotor behavior of the goldfish, Carassius auratus. A highly significant time-dependent correlation between consecutive turns in the locomotor pattern of normal goldfish attributed to a 'memory' process in the pertaining locomotor control mechanism in the central nervous system, is significantly reduced within 4 days by chronic exposure of the fish to 10 microgram/liter p,p'-DDT. Keeping the fish in clean water during 130-139 days did not result in the restoration of the above correlation. (Byrd-Battelle)
W73-04707

CHANGE IN THERMAL REGIME AS A CAUSE OF REDUCTION OF BENTHIC FAUNA DOWNSTREAM OF A RESERVOIR,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
D. M. Lehmkuhl.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1329-1332, September 1972. 2 fig, 10 ref.

Descriptors: *Benthic fauna, *Water temperature, *Reservoirs, *Thermal stress, Thermal pollution, Water pollution effects, Water cooling, Heated water, Crustaceans, Leeches, Thermal stratification, Mollusks, Larvae, Limiting factors, Caddisflies, Aquatic beetles, Stoneflies, Midges, Aquatic insects, Mayflies, Diptera.
Identifiers: Macroinvertebrates, Diving beetles, Clubtails, Chironomids, Water boatmen, Saskatchewan River, Chironomidae, Corixidae, Dytiscidae, Gomphidae, Isonychia sicca, Lachlania saskatchewanensis, Anepeorus rusticus, Epeorus, Choroterpes albiannulata, Traverella albertana, Ephemerella, Brachycercus prudens, Ephoron album, Pseudiron centralis, Ephemera simulans, Ametropus neavei, Siphloplecton, Baetisca bajkovi.

Thermal effects on benthic fauna located downstream from a reservoir were studied. A great reduction in the kinds and numbers of Ephemeroptera and other insects in the Saskatchewan River is attributed to changes in river temperatures caused by the reservoir. The river is warmed in winter and cooled in summer. Consequently, mayflies and other insects with strict thermal requirements cannot hatch and grow successfully. The effect is evident 70 miles downstream. (Byrd-Battelle)
W73-04708

DEPTH DISTRIBUTION OF BENTHIC POLYCHAETES IN TWO FIORDS ON ELLESMERE ISLAND, N.W.T.,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
M. A. Curtis.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1319-1327, September 1972. 2 fig, 2 tab, 15 ref.

Descriptors: *Ecological distribution, *Benthic fauna, *Fjords, *Spatial distribution, Bottom sampling, Animal populations, Water quality, Environmental effects, Annelids.
Identifiers: *Ellesmere Island, *Polychaetes, Macroinvertebrates, Spiophanes, Spirobis, Hare Fjord, Tanquary Fjord.

The relation between depth and population density is described for a number of benthic polychaetes in Hare and Tanquary fiords on Ellesmere Island. Benthic fauna of the two fiords was collected in replicate grab samples taken at standardized depths from 6 to 100 m. From this collection, 68 polychaete species were identified. Two of these, Hartmania moorei Pettibone and Zeppelinia monostyla (Zeppelin), have not previously been reported in the Arctic. Population densities of common species demonstrate a marked relation to depth and the distributions of single species were similar in each fiord. Distributions at less than 10 m in Tanquary Fiord appear to be greatly modified by the presence of fiord water, a brackish surface layer formed during the summer ice melt. Among the polychaetes, depth ranges and depths of greatest abundance usually differed and so the species appeared to be scattered along the depth gradient rather than grouped in distinct assemblages. (Byrd-Battelle)
W73-04709

TOXICITY OF HYDROGEN SULFIDE TO GOLDFISH (CARASSIUS AURATUS) AS INFLUENCED BY TEMPERATURE, OXYGEN, AND BIOASSAY TECHNIQUES,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
I. R. Adelman, and L. L. Smith, Jr.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1309-1317, September 1972. 4 fig, 3 tab, 27 ref.

Descriptors: *Bioassay, *Toxicity, *Oxygen, *Hydrogen sulfide, *Methodology, Lethal limit, Hardness (Water), Physiochemical properties, Calcium, Magnesium, Iron, Manganese, Chlorides, Sulfates, Fluorides, Phosphorus, Sodium, Potassium, Nitrogen, Phenols, Water properties, Water pollution effects, Water temperature, Dissolved oxygen, Water analysis.
Identifiers: *Goldfish, *Carassius auratus.

Bioassays were conducted to test the effect of temperature and oxygen on H2S toxicity to goldfish (Carassius auratus) and to investigate some factors that influence bioassay results. Relation of H2S toxicity to temperature is negatively logarithmic over the range of 6.5-25C. The mean 96-hr TL50 at 6C was 530 micrograms/liter and at 25C was 4 microgram/liter. At temperatures of 14, 20, and 26C, most acute mortality from H2S ended by 11 days and the 11-day TL50's at these temperatures were significantly different. In bioassays with and without prior oxygen acclimation, decreasing oxygen concentrations increased H2S toxicity. In the former, mean TL50's were 62 and 48 micrograms/liter H2S at oxygen concentrations of 6 and 1.5 milligrams/liter, respectively, and in the latter, 71 and 53 micrograms/liter H2S at the same oxygen concentrations. Variability in bioassay results was not affected by test temperatures of 14, 20, and 26C, and in most cases 1 week of temperature acclimation was adequate. Stocks of fish responded differently after 11 days of bioassay, although differences were not detected after 4 days of bioassay. (Byrd-Battelle)
W73-04710

ACUTE TOXICITY OF YELLOW PHOSPHORUS TO ATLANTIC COD (GADUS MORHUA) AND ATLANTIC SALMON (SALMO SALAR) SMOLTS,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
G. L. Fletcher, and R. J. Hoyle.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1295-1301, September 1972. 5 fig, 1 tab, 11 ref.

Descriptors: *Atlantic salmon, *Toxicity, *Smelt, *Fish diseases, Marine fish, Growth stages, Juvenile growth stage, Water pollution effects, Lethal limit, Bioassay, Animal pathology, Commercial fish, Seawater.

Identifiers: *Yellow phosphorus, *Atlantic cod, Grilse, Parr, Salmo salar, Gadus morhua.

The acute toxicity of yellow phosphorus (P4) to Atlantic cod (Gadus morhua) and Atlantic salmon (Salmo salar) smolts was investigated using two experimental procedures: (a) continuous exposure and b) single brief exposure. In continuous-exposure experiments, P4 was lethal to cod and seawater-maintained salmon at concentrations as low as 1.89 and 0.79 micrograms/liter, respectively. Salmon that were exposed to P4 concentrations of 40 micrograms/liter or less developed a distinct external red color and showed signs of extensive hemolysis. At death, salmon that had been exposed to P4 concentrations of 90 micrograms/liter and lower showed a progressive decline in hematocrits. In contrast, cod were never observed to show any evidence of external redness, hemoloysis, or reduced hematocrits. In the brief-exposure experiments, cod and salmon were subjected (20 min to 3.5 hr) to P4 concentrations ranging from 245 to 4030 micrograms/liter. These brief exposures resulted in mortalities to both species that were delayed for as long as 2 weeks. Salmon turned 'red' 16-24 hr following exposure, and at death showed evidence of hemolysis and reduced hematocrits. None of the cod exhibited any of these symptoms. (Holoman-Battelle)
W73-04711

EFFECTS OF SOLAR RADIATION AND UPWELLING ON DAILY PRIMARY PRODUCTION OFF OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. F. Small, H. Curl, Jr., and W. A. Glooschenko.
Journal of the Fisheries Research Board of Canada, Vol 29, No 9, p 1269-1275, September 1972. 8 fig, 19 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Aquatic plants, *Solar radiation, *Upwelling, *Oregon, *Environmental effects, Phtosynthesis, Coasts, Measurement, Euphotic zone, Light penetration, Light intensity, Aquatic populations, Sea water.
Identifiers: Chlorophyll a.

Primary production was measured in units of gC per sq m per day (equals P) and gC per gram Chl a per day on a per meter squared basis (equals P sub Chl) for 4 years in Oregon coastal waters and offshore areas. P, and particularly P sub Chl, were functions of daily photosynthetically usable radiation inshore except in summer, and offshore apparently during all seasons. Values of P and P sub Chl for a given daily input of usable radiation were higher inshore than offshore, probably because of more efficient use of penetrating light by the relatively heavy coastal phytoplankton populations in nutrient-rich water. Evidence is presented that inshore phytoplankton populations in winter are acclimated to low light relative to inshore populations in spring. P and P sub Chl are related to the interaction of daily radiation and degree of upwelling in Oregon coastal waters in summer. P is a function of photic depth offshore and inshore, except in summer. Probably the presence of large quantities of non-photosynthesizing detritus, even in areas of upwelling, destroys the relation in summer. There apparently is no simple relation involving daily production and certain significant environmental factors which will allow prediction of daily production in all regions of the ocean during all seasons. (Mackan-Battelle)
W73-04713

TROPHIC RELATIONSHIPS IN THE WATER HYACINTH COMMUNITY,
Stetson Univ., DeLand, Fla.
K. L. Hansen, E. G. Ruby, and R. L. Thompson.
I J Fla Acad Sci. Vol 34, No 2, p 107-113. 1971. Illus.

Identifiers: Biological communities, *Food chains, Eichornia crassipes M, Enneacanthus, Hyalella azteca, Hyla azteca, Hyla cinerea, Ictalurus, Lepomis, Pomacea paludosa, Procambarus fallax, Relationships, *Water Hyacinth.

Trophic relationships of 2 producers, 5 herbivores, and 11 carnivores of the water hyacinth (Eichornia crassipes) community from the St. John's River were studied in the summer of 1969. Food chain determinations were established using a radionuclide tracer technique, stomach analyses, and feeding observation. Hyalella azteca, Procambarus fallax, Pomacea paludosa, and Hyla c. cinerea were found to feed upon the water hyacinth. The amphipod H. azteca was shown to be the principal herbivore of this ecosystem and also served as a food source for 4 piscine carnivores (Ictalurus nebulosus marmoratus, Lepomis p. punctatus, L. macrochirus purpurescens, Enneacanthus gloriosus). Evidence from the P-32 tracer study suggested that H. azteca is probably eaten by 4 other fish species and 4 arthropods.--Copyright 1972, Biological Abstracts, Inc.
W73-04721

ACUTE TOXICOLOGY OF SODIUM NITRILOTRIACETIC ACID (NTA) AND NTA--CONTAINING DETERGENTS TO MARINE ORGANISMS,
National Marine Water Quality Lab., West Kingston, R.I.
R. Eisler, G. R. Gardner, R. J. Hennekey, G. LaRoche, and D. F. Walsh.
Water Research, Vol 6, No 9, p 1009-1027, September 1972. 14 fig, 7 tab, 28 ref.

Descriptors: *Toxicity, *Nitrilotriacetic acid, *Detergents, *Marine fish, *Cadmium, *Mercury, *Animal pathology, *Clams, *Shrimp, *Lobsters, *Mussels, *Annelids, Bioassay, Striped bass, Biomass, Water temperature, Salinity, Water pollution effects, Invertebrates, Crustaceans, Shellfish, Snails, Sea basses, Marine animals, Pathology.
Identifiers: Starfish, Macroinvertebrates, Sandworms, Hermit crab, Mud snail, Grass shrimp, Mummichogs, Bay mussel, Polychaetes, Nereis virens, Nassarius obsoletus, Pagarus longicarpus, Palaemonetes vulgaris, Roccus saxatilis, Mytilus edulis, Mercenaria mercenaria, Homarus americanus, Asterias forbesi, Stenotomus chrysops, Histopathology.

Static acute toxicity tests were conducted at 20 C and 2.0 percent salinity with (CH2-COONa)3N.H20 (NTA) and two NTA-containing commercial household synthetic detergents (syndets), using adults or juveniles from eleven species of marine fishes and invertebrates. Concentrations of NTA in the medium allowing 50 percent survival of individual test species in 168 h, equals TL50 (168 h) values, ranged between 1800 mg per l for grass shrimp, Palaemonetes vulgaris, and greater than 10,000 mg per l for quahaug clam, Mercenaria mercenaria. The two syndets tested were considerably more toxic than NTA to marine organisms under identical assay conditions. Fishes were the least resistant group of organisms tested to syndets; TL50 (168 h) values for toleosts ranged between 4.6 and 36.0 mg per l total packaged product. Histopathology was investigated for grass shrimp, hermit crab, quahaug clam, sandworm, scup, striped bass and mummichog that survived high concentrations of NTA or syndets for 168 h. The effect of biomass, water temperature and salinity on acute toxicity of NTA and syndets to mummichogs was also investigated. Mixtures of NTA and salts of cadmium or mercury were evaluated for toxicity to mummichog. An observed decrease in biocidal properties of Cd (2 plus) was observed with increasing levels of NTA. Results of studies with NTA-Hg (2 plus) mixtures were inconclusive. Tests with mixtures of syndet and Cd (2 plus) or Hg (2 plus) demonstrated that toxicity to mummichog of these mixtures could be expressed as a simple summation of the toxicity of individual components. It is concluded that NTA might be hazardous to marine fishes and macroinvertebrates when used as a partial replacement for sodium tripolyphosphate in household syndets. (Little-Battelle)
W73-04724

BIOLOGICAL DAMAGE FROM INTRANUCLEAR TRITIUM: DNA STRAND BREAKS AND THEIR REPAIR,
California Univ., San Francisco. Lab. of Radiobiology.
J. E. Cleaver, G. H. Thomas, and H. J. Burki.
Science, Vol 177, No 4053, p 996-998, September 15, 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Tritium, *Water pollution effects, *Radioactivity techniques, *Radioactivity effects, Environmental effects, X-rays, Efficiencies, Irradiation, Genetics.
Identifiers: *DNA, Thymidine, Chinese hamster, Biological samples, Sample preparation, Mutation.

The biological damage from intracellular tritium was observed in Chinese hamster cells in order to determine the possible harmful effects that might result from radioactive waste products in the environment. Isotopic decay in tritiated thymidine in the DNA of frozen (minus 196 C) Chinese hamster cells causes breaks in DNA strands to accumulate at a rate of 2.1 breaks per decay. After DNA is thawed, the tritium-induced breaks repair rapidly with a half-time of 15 minutes at 37 C. In comparison to breakage by x-rays, the efficiency of DNA strand breakage by tritium is equivalent to 0.48 rad per decay. This dose per decay is close to that predicted by simple dosimetric considerations (0.38 rad per decay) for irradiation by the beta particles from tritium. (Long-Battelle)
W73-04726

EFFECT OF COPPER AND SILVER IONS ON ALGAE,
Cornell Univ., Ithaca, N.Y.
R. G. Young, and D. J. Lisk.
Journal Water Pollution Control Federation, Vol 44, No 8, p 1643-1647, August 1972. 8 fig, 2 tab, 12 ref.

Descriptors: *Copper, *Ions, *Aquatic algae, *Plant growth, *Water pollution effects, Toxicity, Cyanophyta, Chlorophyta, Cultures, Chlorella, Copper sulfate, Spectrometer, Fish, Water pollution control, Growth rates, Anabaena, Heavy metals, Algal control, Water quality control, Laboratory tests.
Identifiers: *Silver, Synergistic effects, Silver nitrate, Anacystis nidulans, Anabaena variabilis, Anabaena flos-aquae, Eudorina coliformica, Pediastrum biradiatum, Chlorella vulgaris, Atomic absorption spectrophotometry.

Laboratory experiments were conducted with a mixture of copper and silver to determine whether fewer total ions with recognized toxicity to fish would affect the control of certain algal species. Pure cultures of Cyanophyta and Chlorophyta species were grown on artificial media and additions of copper sulfate and silver nitrate were made from stock solutions. Algal growth was measured at intervals by optical density readings in a spectrometer. The effects of the additions varied with the species. With Anabaena flos-aquae, for example, 0.1 mg/l of mixed ions caused diminution of growth, while 0.1 mg/l copper alone had no effect whereas with anacystis nidulans copper was more effective than the mixture. The use of copper imposes a hazard to desirable fish species and this hazard is increased by addition of silver ions. Although the copper-silver combination was usually slightly more effective in this study, its utility is questionable due to the increased risk to fish and to greater cost. (Mortland-Battelle)
W73-04731

PLATING MEDIUM PH AS A FACTOR IN APPARENT SURVIVAL OF SUBLETHALLY STRESSED YEASTS,
Arizona Univ., Tucson.
F. E. Nelson.
Applied Microbiology, Vol 24, No 2, p 236-239, August 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Yeasts, *Hydrogen ion concentration, *Thermal stress, Fungi, Cultures, Pollutant identification, Pathogenic fungi.
Identifiers: *Culture media, *Culturing techniques, Recovery, Survival, Potato dextrose agar, Saccharomyces cerevisiae, Endomyces magnusii, Candida albicans, Candida utilis, Kluyveromyces lactis, Pichia kluyveri, Torulopsis glabrata, Rhodotorula glutinis, Hansenula anomala, Candida vinii, Selective media.

Yeasts of 10 different species were cultured in yeast maltose broth at about 24 C. After they were thermally stressed for the required period of time, plates were poured with PDA (Difco) and the pH adjusted to several levels by the addition of NaOH or H2SO4 after cooling to 47C. The extremes of pH employed, whether acid or alkaline, had less effect on the counts of unstressed organisms than on the stressed organisms in all cases. As the degree of stress was increased, as shown for S. cerevise Y 2034 and Kluyveromyces lactis, the reductions in counts at pH extremes increased markedly. Sublethally stressed cells of 9 of 10 species of yeast were recovered at maximum levels when potato dextrose agar was adjusted to approximately pH 8. The optimum for Candida utilis was at approximately pH 10. At pH 3.5, as commonly employed with media selective for yeasts and molds, recovery of heat-stressed organisms ranged from essentially the same as at optimum pH to levels of 1 percent or less of the maximum count. The extent to which this may be of practical significance in assessing the microbiological quality of food products remains to be determined. (Long-Battelle)
W73-04816

ERYTHRITOL AS A SELECTIVE SUBSTRATE FOR THE GROWTH OF SERRATIA MARCESCENS,
Cedars-Sinai Medical Center, Los Angeles, Calif.
I. J. Slotnick, and M. Dougherty.
Applied Microbiology, Vol 24, No 2, p 292-293, August 1972. 1 tab, 5 ref.

Descriptors: *Growth rates, *Enteric bacteria, *Pathogenic bacteria, E. coli, Salmonella, Shigella, Pseudomonas, Coliforms, Aerobic bacteria, Aquatic bacteria, Organic compounds.
Identifiers: *Serratia marcescens, *Selective media, *Erythritol, Substrate utilization, Culture media, Enterobacter, Klebsiella, Erwinia, Proteus vulgaris, Proteus morgani, Proteus rettgeri, Proteus mirabilis, Salmonella typhimurium, Shigella somnei, Citrobacter freundii, Edwardsiella tarda, Pseudomonas aeruginosa, Substrates.

Serratia marcescens grew on a basal medium containing 0.5 percent erythritol as sole source of carbon for growth and energy. Only an occasional strain of Enterobacter aerogenes among several members of the family Enterobacteriaceae were able to utilize erythritol. (Holoman-Battelle)
W73-04817

KINETIC STUDIES OF C. PYRENOIDOSA USING 94 PERCENT C-13-C02,
Los Alamos Scientific Lab., N. Mex.
E. B. Fowler, W. H. Adams, C. W. Christenson, V. H. Kollman, and J. R. Buchholz.
Biotechnology and Bioengineering, Vol 14, No 5, p 819-829, September 1972. 5 fig, 2 tab, 10 ref.

Descriptors: *Metabolism, *Nutrients, *Plant growth, *Growth rates, Cultures, Laboratory equipment, Growth chambers, Carbon radioisotopes, Carbon dioxide, Light intensity, Photosynthesis, Light penetration, Enzymes, Aquatic algae, Primary productivity.
Identifiers: *Chlorella pyrenoidosa, *Growth kinetics, C-13, Growth media.

Chlorella pyrenoidosa has been grown in mass quantities on 94 at. percent C-13-C02 by use of special rocking culture boxes made of lucite and an automatic pH monitoring - C02 injection system. Three experiments were done. Experiments 1 and 2 involved growth kinetics in 5-liter growth chambers where 8 runs were performed, such that the inoculum for each run (120 hr) contained the C-13 which had been incorporated by the previous run, thereby maintaining the cells more nearly in the log growth phase. Relative mass was plotted versus time. A continuing culture in a 25-1 box for 10 runs constituted the third experiment. No inhibition or adjustment periods were observed. The limiting slope of the growth curve for experiments 1 and 2 increased from 0.25 to 0.29 as the cellular content of C-13 increased from natural to 92 percent or more. The limiting slope in 3 increased from 0.13 to 0.16 as C-13 increased from 1.1 percent to 92.7 percent. Amounts of incorporated C-13/run were determined by mass spectrometry. Growth appeared stimulated by the C-13 but this was not attributed to C weight differences. Growth was affected by light intensity as affected by cellular mass, becoming a deleterious factor as density increases. Differences imparted by C-13 bond energies may affect the enzyme systems thereby affecting growth kinetics. (Mackan-Battelle)
W73-04849

INACTIVATION OF SALMONELLA TYPHIMURIUM BY SORBIC ACID,
Wisconsin Univ., Madison. Dept. of Food Science; and Wisconsin Univ., Madison. Food Research Inst.
H. S. Park, and E. H. Marth.
Journal of Milk and Food Technology, Vol 35, No 9, p 532-539, September 1972. 9 fig, 1 tab, 12 ref.

Descriptors: *Inhibition, Nutrients, Hydrogen ion concentration, Cultures, Temperature, Milk, Growth rates, Water pollution effects, Organic acids, Aqueous solutions, Enteric bacteria, Aerobic bacteria, Coliforms.
Identifiers: *Salmonella typhimurium, *Sorbic acid, *Inactivation, Nutrient broth, Culture media.

Nutrient broth, skimmilk, and evaporated milk at pH 5.0, 5.5, or without pH adjustment and with and without 2,000 and 3,000 ppm sorbic acid were evaluated at 7, 13, and 37 C for their effects on Salmonella typhimurium. The combination of 3,000 ppm sorbic acid and acetic acid at pH 5.0 most effectively inactivated S. typhimurium in all media and at all temperatures. Complete inactivation by this treatment required from 12 hr or less in nutrient broth at 37 C to 55 days in evaporated milk at 7 C. In some instances, treatment with 3,000 ppm sorbic acid combined with lactic acid at pH 5.0 was equally effective. Reducation of sorbic acid concentration to 2,000 ppm or raising the pH of the substrate to 5.5 increased the time needed for inactivation of S. typhimurium. Inactivation of S. typhimurium was most rapid in nutrient both at 37 C and required progressively more time either as the temperature was reduced or as more complex foods were substituted for the broth. Growth of S. typhimurium occurred at 37 and 13 C in plain nutrient broth, in nutrient broth at pH 5.0 or 5.5, and in nutrient broth with 2,000 or 3,000 ppm sorbic acid (pH not adjusted). Growth in skimmilk occurred under similar conditions except when the pH was reduced to 5.0 with acetic acid. In evaporated milk, growth at both temperatures was possible only in untreated samples and in those acidified to pH 5.5. In some instances, a lag period of 25-29 days occurred at 13 C before growth was evident. (Byrd-Battelle)
W73-04851

BACTERIOLOGICAL QUALITY AND OCCURRENCE OF VIRBIOS IN DUNGENESS CRABMEAT IN OREGON PROCESSING PLANTS AND MARKETS,
Oregon State Univ., Corvallis. Dept. of Foods and Nutrition; and Oregon State Univ., Corvallis. Dept. of Home Economics Research.
For primary bibliographic entry see Field 05A.
W73-04852

THE EFFECT OF CARBON DIOXIDE AND PARTICLE SURFACE AREA ON THE MICROBIOLOGICAL LEACHING OF A ZINC SULFIDE CONCENTRATE,
Department of Natural Resources, Quebec.
For primary bibliographic entry see Field 05B.
W73-04855

MODEL FOR THE GROWTH OF AEROBIC MICROORGANISMS UNDER OXYGEN LIMITING CONDITIONS,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-04856

EFFECT OF GLUTARALDEHYDE ON THE OUTER LAYERS OF ESCHERICHIA COLI,
Welsh Coll. of Advanced Technology, Cardiff. Welsh School of Pharmacy.
For primary bibliographic entry see Field 05B.
W73-04857

GROWTH AND CELLULASE FORMATION BY CELLVIBRIO FLUVUS,
Uppsala Univ. (Sweden). Biokemiska Institutionen.
For primary bibliographic entry see Field 05B.
W73-04858

ENTERIC BACTERIAL GROWTH RATES IN RIVER WATER,
Georgia Univ., Athens. Dept. of Microbiology.
C. W. Hendricks.
Applied Microbiology, Vol 24, No 2, p 168-174, August 1972. 4 fig, 3 tab, 25 ref.

Descriptors: *Enteric bacteria, *Freshwater, *Growth rates, *Rivers, *Sewage effluents, Pathogenic bacteria, E. coli, Coliforms, Shigella, Salmonella, Aerobic bacteria, Cultures, Nutrients, Aquatic bacteria, Water temperature, Outfall sewers.
Identifiers: Salmonella senftenberg, Enterobacter aerogenes, Proteus rettgeri, Arizona arizonae, Shigella flexneri, Heterotrophic bacteria, Aerobacter aerogenes, Paracolobactrum arizonae, Chemostat, Continuous cultures.

Enteric bacteria, including stocked strains of pathogenic species and organisms naturally present in the stream, were capable of growth in a chrmostat with autoclaved river water taken 750 m below a sewage outfall. Maximal specific growth rates for all organisms occurred at 30 C, whereas culture generation times ranged between 33.3 and 116 hr. Of the six laboratory strains of enteric species used, Escherichia coli and Enterobacter aerogenes grew at generation times of 34.5 and 33.3 hr, respectively, while the remaining Proteus, Arixona, Salmonella, and Shigella spp. reproduced at a rate two to three times slower than the coliforms. Little or no growth occurred in the water at incubation temperatures of 20 and 5 C, and death was observed for Salmonella senftenberg at 20 and 5 C and for E. aerogenes and Proteus rettgeri at 5 C. When enteric bacteria naturally present in the river water were employed in similar experiments, coliform bacteria demonstrated a generation time of approximately 116 hr, whereas fecal coliforms failed to grow. Growth of the bacteria from the river demonstrated a

periodicity of approximately 100 hr, which suggests that much of the growth of these organisms in the chemostat may be on the glass surfaces. This phenomenon, however, was not observed with any of the stocked enteric species. Neither the stock cultures nor the aquatic strains were capable of growth in autoclaved river water taken above the sewage outfall at the three temperatures tested. (Holoman-Battelle)
W73-04861

PHTOOXIDATIVE DEATH IN BLUE-GREEN ALGAE,
Hebrew Univ., Jerusalem (Israel). Dept. of Microbiological Chemistry.
A. Abeliovich, and M. Shilo.
Journal of Bacteriology, Vol III, No 3, p 682-689, September 1972. 7 fig, 4 tab, 25 ref.

Descriptors: *Cyanophyta, *Mortality, *Photosynthesis, *Light intensity, Oxygen, Carbon dioxide, Ponds, Water pollution effects, Water temperature, Plant pigments, Aquatic algae, Thermal stress, Physiological ecology, Plant physiology, Viability, Cultures, Degradation (Decomposition), Eutrophication.
Identifiers: *Photooxidation, Anacystis nidulans, Synechococcus cedrorum, Carotenoids, Chlorophyll a, 3- (34-dichlorophenyl)-1 1-dimethylurea, Potassium cyanide.

Investigations on photooxidative death in blue-green algae are presented and its possible ecological significance is discussed. When incubated in the light under 100 percent oxygen, wild-type blue-green algae (Anacystis nidulans, Synechococcus cedrorum) die out rapidly at temperatures of 4 to 15 C, and at 35 C (or at 26 C in the case of S. cedrorum) in the absence of CO2. Photosynthesis is impaired in these cells long before they die. Blocking of photosystem II at high temperatures in the presence of CO2 sensitizes the algae to photooxidative death. Photooxidative death and bleaching of photosynthetic pigments are separable phenomena. Photooxidative conditions were demonstrated in Israeli fish ponds using A. nidulans as the test organism during dense summer blooms, when dissolved CO2 is low, and in winter, when water temperatures generally drop below 15 C. This finding suggests that photooxidative death may be responsible for the sudden decomposition of blue-green blooms in summer, and may be a factor in the absence of blue-green blooms in winter. (Byrd-Battelle)
W73-04863

DEGRADATION AND MINERALIZATION OF PETROLEUM IN SEA WATER: LIMITATION BY NITROGEN AND PHOSPHORUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 05B.
W73-04873

MEASUREMENTS ON THE INTERFACIAL AREAS OF HYDROCARBON IN YEAST FERMENTATIONS AND RELATIONSHIPS TO SPECIFIC GROWTH RATES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
For primary bibliographic entry see Field 05B.
W73-04876

CONVERSION OF DETERIORATED METAL CUTTING FLUIDS INTO PROTEIN,
McNeese State Univ., Lake Charles, La. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-04877

EFFECT OF CHEMICAL STRUCTURE ON MICROBIAL DEGRADATION OF METHYL-SUBSTITUTED ALIPHATIC ACIDS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-04884

RELATIONSHIPS BETWEEN LAKE TROPHIC STATE AND NITROGEN AND PHOSPHORUS LOADING RATES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
E. E. Shannon, and P. L. Brezonik.
Environmental Science and Technology, Vol 6, No 8, p 719-725, August 1972. 2 fig, 5 tab, 25 ref.

Descriptors: *Trophic level, *Nutrients, *Lakes, *Nitrogen, *Phosphorus, *Waste water, Water pollution effects, Agricultural runoff, Industrial wastes, Freshwater, Mathematical studies, Statistical methods, Regression analysis, Florida, Eutrophication, Watersheds (Basins).
Identifiers: Trophic state index, Volatilization.

Nitrogen and phosphorus budgets were calculated for 55 north-central Florida lakes by considering watershed land use patterns and population characteristics. Nitrogen and phosphorus contributions to the lakes form the various land use areas, the residences within the watershed, and point sources, such as sewage treatment plants, were estimated, totaled, and expressed as annual loadings per unit lake volume. Significant multiple regression relationships between a quantitative index of trophic state (TSI) and the nitrogen and phosphorus loadings indicate that lake trophic state is largely dependent on the gross supply of nitrogen and phosphorus to the lake. Furthermore, it appears that phosphorus loading is more significant (or the limiting factor). Graphical relationships between the TSI and nitrogen and phosphorus loadings were devised, and these may be useful in predicting lake response to a particular nitrogen or phosphorus loading. Sources of uncertainty in relating lake trophic state to nutrient supply are discussed in light of the results. (Long-Battelle)
W73-04888

PERMISSIBLE LEVELS OF TRITIUM IN MAN AND THE ENVIRONMENT,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
R. V. Osborne.
Radiat Res. Vol 50, No 1, p 197-211. 1972. Illus.
Identifiers: *Public health, Body, Burden, Dose, Environment, Rates, *Tritium, Safety.

The physiological parameters needed for estimating the activity of tritium taken into the body from various tritiated environments are well established experimentally. Less certain is the relation of dose equivalent rate to body burden. A quality factor of unity appears reasonable. For chronic exposures to tritium, isotopic concentrations effects and transmutation effects are unimportant. The choice of body water as the critical organ is conservative since no tissue has a higher proportion of hydrogen. Recommended limiting levels for tritium in drinking water, in air and in food are also conservative. For acute exposures, the main problem is estimating the dose equivalent from tritium bound to tissue components. One general analysis suggests an upper limit for this of 25% of the dose equivalent from tritium in body water.--Copyright 1972, Biological Abstracts, Inc.
W73-04920

THE PHYSIOLOGICAL BASIS OF FLOODING TOLERANCE,
Saint Andrews Univ. (Scotland). Dept. of Botany.
R. M. M. Crawford.
Ber Deut Bot Ges. Vol 82, No 1/2, p 111-114. 1969.
Identifiers: Alcohol, Dehydrogenase, *Ethanol, *Flooding tolerance, Glycolysis, Malic acid, Physiology, *Anaerobic conditions.

Non-flood-tolerant species appear to be excluded from high water table habitats due to the production of increased amounts of ethanol resulting from an increased rate of glycolysis induced by the anaerobic conditions. Flood-tolerant species do not show this acceleration of glycolysis and when the effect of anaerobic conditions and acetaldehyde are examined on alcohol dehydrogenase activity the induction effect is always greater in the case of the non-flood-tolerant species. The flood tolerant species always appear more homeostatic. Evidence is also found for a metabolic switch from ethanol to malic acid accumulation under anaerobic conditions in those species that are able to withstand flooded conditions. It is suggested that this along with the homeostatic properties noted above, contributes in flood-tolerant species to their avoidance of excess ethanol accumulation and accounts for their ability to withstand periods of anoxia.--Copyright 1972, Biological Abstracts, Inc.
W73-04989

CULTURE MEDIA FOR DEMONSTRATION OF ENTEROCOCCI: A CONTRIBUTION TO BACTERIOLOGICAL WATER INVESTIGATION IN THE ROUTINE LABORATORY, (IN GERMAN),
For primary bibliographic entry see Field 05B.
W73-05019

DETERGENTS AND THE NATION'S WATER,
League of Conservation Voters, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-05021

WASTE RESTRICTIONS,
Gumm (Frederick J.) Chemical Co., Inc., Kearny, N.J.
For primary bibliographic entry see Field 05D.
W73-05040

UNICELLULAR PROTEIN PRODUCTION USING DOMESTIC WASTEWATER,
Asian Inst. of Tech., Bangkok (Thailand).
M. G. McGarry.
Thai J Agric Sci, Vol 4, No 4, p 213-223, 1971, Illus.
Identifiers: *Algae, Cattle, Chicken, Human, *Proteins, Swine, *Waste water, *Unicellular protein.

Unicellular algae were grown on a pilot plant scale in open ponds using nutrients derived from human wastes. After harvesting, the algae may be used as a dietary source of protein for chickens, swine and cattle. The overall process is described in terms of algal growth, concentration, hydration and drying. Besides the availability of an inexpensive source of protein, several other benefits accrue to a community using algal production on wastes.--Copyright 1972, Biological Abstracts, Inc.
W73-05076

STROBILATION IN THE CHESAPEAKE BAY SEA NETTLE CHRYSAORA QUINQUECIRRHA: I. THE EFFECTS OF ENVIRONMENTAL TEMPERATURE CHANGES ON STROBILATION AND GROWTH,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
M. J. Loeb.
J Exp Zool. Vol 180, No 2, p 279-291. 1972. Illus.
Identifiers: Bays, *Chesapeake Bay, Chrysaora-quinquecirrha, Environmental effects, Growth, Sea-nettle, *Strobilation, Temperature, *Chrysaora polyps.

Observation of Chrysaora polyps taken from the Chesapeake Bay and maintained in the laboratory reveals at least 4 morphological types of animals, chiefly distinguished by the number of tentacles they bear and the manner of strobilation. All of the types strobilate when warmed after sufficient chilling; several waves of strobilations may result from the initial stimulus. One of the types of Chrysaora polyps was selected for characterization with respect to environment control of its strobilation behavior. These animals must be chilled for a minimum of 7 wk at 20 C before they are able to respond to warming to 26 C by strobilating; it is proposed that a number of factors accumulate during chilling which enable polyps to strobilate when warmed. The time course of strobilation including release of ephyrae, appears to be determined by the temperature at which strobilation is initiated. The growth of Chrysaora polyps seems to be regulated by both the exact temperature of the environment and relative changes in environmental temperature. (Biological Abstracts, Inc.)
W73-05089

A NEW SPECIES OF KUDOA (MYXOSPORIDEA:CHLOROMYXIDAE) FROM THE SPOT, LEIOSTOMUS XANTHURUS LACEPEDE, IN CLEAR LAKE, TEXAS,
Texas Agricultural Experiment Station, College Station. Dept. of Veterinary Parasitology.
J. E. Joy.
J Protozool, Vol 19, No 2, p 264-265, 1972, Illus.
Identifiers: Chloromyxidae, Gills, *Kudoa, Kudoa-Branchiata, Lakes, Leiostomus-Xanthurus, Myxosporidea, Parasites, Species, *Spot, Texas, *Clear Lake (Tex).

Kudoa branchiata (Myxosporidea:Chloromyxidae) is described from the gills of the marine sciaenid fish, Leiostomus xanthurus from Clear Lake, Texas. Twelve of the 429 hosts examined from 10 Sept. 1970 to 28 April 1971, were infected. Eight of the 12 infected fish were collected in Feb. and March 1971-a period during which only 13% of the total host sample was taken. The mean total length of infected hosts was 149 mm, with a range of 112-185 mm. The mean number of myxosporidean cysts per infected host was 3.5, with a range of 1-11.--Copyright 1972, Biological Abstracts, Inc.
W73-05090

ON LIMNOLOGICAL ASSESSMENT OF EUTROPHIC SHALLOW LAKES BY THEIR BIOMASS,
L. Kalbe.
Limnologica, Vol 8, No 2, p 311-320. 1971. Illus.
Identifiers: Aphanizomenon flos aquae, Assessment, Biomass, Eutrophication, Germany, Havel, *Lakes, *Limnology, Oscillatoria limnetica redeckei, Oxygen, Plankton, Production, Shallow.

The biomass was determined by counting cell numbers of phytoplankton, by determining chlorophyll and by determination of the dry weight of floating matter collected on a membrane filter. Three lakes in the Havel region were investigated (the Blanken lake, the Groessin lake and the Dreetz lake). All 3 measured values increased from the beginning of the year to the summer months and fall again in Sept. In the summer months, Aphanizomenon flos-aquae, Oscillatoria limnetica redeckei and O. agardhii are dominant. Dreetz lake is rich in Cyanophyceae. A list of many species is given for all 3 lakes at various seasons. The lakes are eutrophic with summer maxima of over 600,000 cells/ml. The chlorophyll content usually agrees with the cell count. The membrane filter determination was higher for the Dreetz lake unlike the chlorophyll and cell count probably because of thick walled chlorophyll-poor cells. O2 production was measured by the bright-dark flask method. The Dreetz lake had lower O2 production although it had a higher biomass.--Copyright 1972, Biological Abstracts, Inc.
W73-05111

ON THE ROLE OF BACTERIA AND SEDIMENT IN THE MATERIAL BALANCE OF LAKES,
Wasserwirtschaftsdir ektion Mittlere Elbe-Sude-Elde, Magdeburg (East Germany).
H. Klapper, and G. Rudolf.
Limnologica, Vol 8, No 2, p 321-336. 1971. Illus.
Identifiers: Algae, *Bacteria, Balance, Lakes, *Lake sediments, Sewage, Water pollution effects.

Three lakes were studied from the standpoint of the liberation of nutrients from sediment which principally involves bacteria. The number of bacteria per ml was highest for the Binnenmueritz lake, which is eutrophic and burdened with sewage from the town of Waren. The bacterial count is given for various depths. The influence of sediment on the O2 balance of the lakes was determined by the sediment activity score which was about 200 mg O2/l of mud for all 3 lakes. Dehydrogenase activity was determined. It was highest in the epilimnic lake, Aussenmueritz and least in the most eutrophic lake (Binnenmueritz). Phosphate compounds were analyzed at various levels. The epilimnic lake showed orthophosphate minima at the same time as the algae maxima. The Drewitz lake has only 1/10 as much phosphate in the interstitial water and 1/5 as much in the deep water as the Binnenmueritz lake. Oligotrophic conditions are indicated also by a lower variation in the course of the year. The N compounds were also analyzed. The variations of maximal and minimal values of inorganic N was higher in the eutrophic lake than in the oligotrophic lake. The calories produced by burning sediment were measured for the 3 lakes. The nutrients held most to sediment in the Drewitz lake with aerobic hypolimnion and least in the unlayered lake (Binnenmueritz).--Copyright 1972, Biological Abstracts, Inc.
W73-05112

NUTRIENT AND OXYGEN RELATIONS OF THE LAKES OF EAST BRANDENBURG,
R. Scharf.
Limnologica, Vol 8, No 2, p 393-414. 1971. Illus.
Identifiers: Brandenburg (Germany), *Lakes, Minerals, *Nutrients, *Oxygen.

Thirty lakes of East Brandenburg are described. The content of total P, dissolved orthophosphate, total N, organic N, nitrate, nitrite and ammonium were determined for differnet seasons and for epilimnion and hypolimnion. The hypolimnic values for phosphate and nitrogen were higher than the epilimnic. Orthophosphate falls from spring in late summer and rises in winter. Total N and organic N were highest in late summer while nitrate and ammonium were highest in winter. The total N and phosphate lies above the danger level for trophic conditions in all the lakes. In 16 of the lakes there is a characteristic thermal layering connected with O2 content in summer. The dissolved O2 falls off in the metalimnion and becomes improverished in hypolimnion. There is supersaturation with O2 in the surface water in the summer. The lakes are generally eutrophic. There is high supply of phosphate compounds accompanied by a lack of nitrate. The phosphate content is 5 fold higher than the average for North American lakes.--Copyright 1972, Biological Abstracts, Inc.
W73-05113

PRODUCTION AND DESTRUCTION IN TROPHOGENIC LEVEL: STUDIES OF ECOLOGICAL PARAMETERS IN POLYTROPHIC ROTSEE AND MESOTROPHIC HORWER BAY (LAKE OF LUCERNE), (IN GERMAN),
E. Schegg.
Schweiz Z Hydrol, Vol 33, No 2, p 425-532. 1971. Illus. English summary.
Identifiers: *Water pollution effects, *Primary productivity, Bacteria, Destruction, Ecology, Horwer Bay, Lake of Lucerne, Mesotrophic, Parameters, Phytoplankton, Pollution, Polytrophic, Rotsee, Switzerland, Trophogenic.

Physical, chemical and biological aspects of a 1-yr cycle (1969-70) in the highly eutrophic Rotsee and the mesotrophic Horwer Bay (Lake Lucerne, Switzerland) were studied. The quantitative and qualitative determination of the bacterial flora and its ecological influence were evaluated. The relationship between bacteria and phytoplankton were also observed. The results are discussed in relation to pollution and primary production of these lake areas.--Copyright 1972, Biological Abstracts, Inc.
W73-05117

TIDAL CYCLE STUDIES IN RELATION TO ZOOPLANKTON DISTRIBUTION IN THE GODAVARI ESTUARY,
Andra Univ. (India). Dept. of Zoology.
P. C. Mohan, and T. S. S. Rao.
Proc Indian Acad Sci Sect B, Vol 75, No 1, p 23-31. 1972. Illus.
Identifiers: *Tidal effects, Copepods, Distribution, Estuary, Godavari River, India, Zooplankton, Relation, Veligers.

The ebb and flow of the tides in an estuary affect not only the hydrographical conditions but also to a marked extent the abundance of zooplankton populations. Observations were made during 1 particular cycle studied during Feb. 1961. Water samples and plankton were collected at regular intervals of 2 hr at a fixed station in the mid-estuarine region of the Godavari river. The temperature of the waters followed the course of the day and the atmospheric conditions, rather than the tides, whereas salinity variations during 24-hr period closely followed the tides. The incoming tides contribute to an increase in the salinity of the estuarine waters. The volume of plankton collected appears to have some relationship with the nature of the tide, strength of the current and the direction of the flow of water. The distribution and abundance of different groups of zooplankton in the estuary followed the tides and the diurnal rhythm. The abundance zooplankton during night was many times higher than during the day and particularly copepods and veligers showed greater densities during the night.--Copyright 1972, Biological Abstracts, Inc.
W73-05119

ECOLOGY OF FREE LIVING CILIATA, (IN POLISH),
Jagellonian Univ., Krakow (Poland). Instytut Zoologii.
A. Czapik.
Przegl Zool. Vol 15, No 3, p 277-282. 1971. English summary.
Identifiers: Basins, *Ciliata, *Ecology, Polluted waters, *Protozoans.

The ecological problems of free living Ciliata with other protozoans of polluted water basins are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-05145

APPLICATION OF A MATHEMATICAL MODELLING METHOD TO THE STUDY OF THE ROLE OF PHOTOSYNTHETIC AERATION IN A LAKE, (IN RUSSIAN),
Adademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
A. A. Umnov.
Ekologiya. Vol 2, No 6, p 5-12. 1971. Illus.
Identifiers: *Aeration, Computer models, Fish, Lakes, *Mathematical models, *Photosynthesis, Phytoplankton, Pollution, Zooplankton.

A mathematical model of a lake ecological system was constructed on a computer. One of the Norochanskie Lakes in Belorussia, USSR, with a depth of 5 m was used. The dynamics of dissolved O2 was studied for a short period (2-3 days), assuming that the concentration of biogenic substances necessary for primary production, the effect of zooplankton and fish on phytoplankton, concentration of organic matter, and O2 concentration would remain unchanged during this time. Light penetration, photosynthesis, atmospheric aeration, death of phytoplankton, the biochemical use of O2, secondary pollution from phytoplankton remains and the processes of O2 transport in the water were considered. Photosynthetic aeration played a decisive role in enriching the O2 content of the water.--Copyright 1972, Biological Abstracts, Inc.
W73-05147

TEST OF EXPERIMENTAL ECOLOGY ON A POOL: THE UTILIZATION OF ENCLOSURES IN NATURAL ENVIRONMENT,
Ecole Nationale Superieure Agronomique de Rennes (France). Laboratoire de Physiologie Vegetale.
R. LeCohu.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 274, No 5, p 693-696. 1972.
Identifiers: Ecology, Enclosures, Environment, Euglena, *Nymphaea-Alba-D, Oedogonium-Gunii, Pools, *Scirpus-Lacustris-M, Stigeoclonium-Helveticum, Test, Trachelomonas-Acanthostoma, Trachelomonas-Hispida, *Algae.

Plexiglass cylinders open at the 2 extremities were placed in ponds at shallow depths. The base was in the mud and the upper end emerged 20 cm. Each cylinder contained 60-80 l of water. The major population near 1 station (1E) was Nymphaea alba and near the other (2E) Scirpus lacustris. Each experimental cylinder (1E, 2E) received 2 mg of N/l in the form of KNO3. Other cylinders (1T, 2T) without KNO3 were used as controls. In cylinder 1E the nitric N rose and in 2E the nitrate at first disappeared, then rose above 2 mg/a,K fluctuated little. Alkalinity rose in the cylinders compared to the surrounding water. Sulfate fell in the cylinders. There was a yearly cycle in organic matter and in silica. Fe, Mn and Ca rose in the cylinders of a reductive microzone permitting the passage of ions from the mud to the water. There were 500 spp. of algae in the pond. In the cylinder 1E, Oedogonium gunnii developed in 1967 and Stigeoclonium helveticum in 1968. In summer, Euglenophyceae become dominant especially Trachelomonas acanthostoma and T. hispida. In the cylinder 1T, Euglena developed from May to Oct., then T. hispida. In the cylinders 2E and 2T, there was less difference with the pond flora. In July-Aug. 1968, T. hispida was found in cylinder 2E coinciding with a high Fe concentration. Thus, the massive development of a single species of algae or a small group of algae is characteristic of these enclosures.--Copyright 1972, Biological Abstracts, Inc.
W73-05148

PRODUCTIVITY AND SOLAR ENERGY CONVERSION IN REEDSWAMP STANDS IN COMPARISON WITH OUTDOOR MASS CULTURES OF ALGAE IN THE TEMPERATE CLIMATE OF CENTRAL EUROPE,
Ceskoslovenska Akademie Ved, Trebon. Botanicky Ustav.
For primary bibliographic entry see Field 02I.
W73-05150

HYDROBIOLOGICAL STUDIES OF THE SALT WATERS OF BELGIUM: XI. STUDY OF MARITIME BASIN IN THE OSTENDE PORT: B. PLANKTON STUDY: C. CONCLUSIONS,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 02L.
W73-05153

STUDY OF BLUE-GREEN ALGAL DISTRIBUTION IN EPHEMERAL BASINS OF THE SIVASH AREA DPENDING ON THE DEGREE OF WATER SALINITY, (IN RUSSIAN),
Akedemiya Nauk URSR, Kliev. Instytut Botaniki.
L. P. Prykhod'Kova.
UKR Bot Zh. Vol 28, No 4, p 415-419, 1971, English summary.
Identifiers: Algal, *Blue-green algae, Distribution, Ephemeral, Lyngbya-estuarii, Microcoleus-chthonoplastes, Nostoc-punctiforme, Phormidium-dimorphum, Phormidium-foveolarum, *Salinity, Sivash, USSR, Water pollution effects.

A total of 72 ephemeral basins were investigated (subsaline-32, saline-15, oversaline-25) with 111 spp. of blue-green algae. In subsaline and saline basins the blue-green algae developed more on the whole and were more often dominant over other groups of algae. The subsaline basins were the richest floristically. The number of species in common for the subsaline, saline and oversaline basins is low (16.2%). Frequency of some species (Phormidium foveolarum, P. dimorphum, Lyngbya estuarii, Nostoc punctiforme) lowered with a rise in mineralization while other, like Microcoleus chthonoplastes, increased.--Copyright 1972, Biological Abstracts, Inc.
W73-05158

CYCLOMORPHOTIC VARIATION OF CERATIUM HIRUNDINELLA IN SHANTY HOLLOW LAKE, WARREN COUNTY, KENTUCKY,
North Carolina State Univ., Raleigh. Dept. of Botany.
For primary bibliographic entry see Field 02H.
W73-05159

CONCERNING POSSIBILITIES OF ASCERTAINING THE ORIGINAL TROPHIC CONDITION IN FLOWING WATER,
W. D. Beer.
Limnologica. Vol 8, No 2, p 253-263. 1971.
Identifiers: Anguilla-Vulgaris, Elster, *Eutrophication, Gasterosteus-Aculeatus, Germany, Leuciscus-Leuciscus, Leuciscus-Rutilus, Margaritifera-Margaritifera, Potamogeton-M, River, Species, Squalius-Cephalus, *Tropic conditions.

The historical trophic conditions of the waters of the White Elster are reviewed. There were 37 different kinds of fish reported in the river. Liebman (1962) showed the relationship between the fish population and water quality of eutrophication. In the Greiz region, the grayling has been missing since 1870 and brook trout has almost vanished, while the bullhead, minnow, loach and gudgeon have become rare. The dace (Leuciscus leuciscus) has wandered in, together with carp and tench. The roach (Leuciscus rutilus), the chub (Squalius cephalus) and the eel (Anguilla vulgaris) are common. The shift towards the carp, tench, chub and roach is characteristic of increased loading of the river. The dace is an indicator of eutrophication but the decreasing O2 content eventually drives the dace out. The large stickleback (Gasterosteus aculeatus) is another inhabitant of O2-poor water or highly saprobic water. Thus, the fish population gives an excellent indication of the state of the water. In earlier times, the trout and grayling regions were associated with the river oyster (Margaritifera margaritifera) inhabiting the oligosaprobic region. The influx of waste water has impoverished the water plants. In earlier times, many water plants occurred of which a list of 20 spp. is given. At that time, the whole Elster was oligo or beta-mesosaprobic. M SELECTION OF (* INVERTEBRATE AND ALGAL SPECIES AS BIOLOGICAL INDICATORS OF WATER QUALITY. Of these, 38 were considered new indicators for the Jui River basin.--Copyright 1972, Biological Abstracts, Inc.
W73-05186

THE SAPROBIOLOGICAL VALUE OF CERTAIN ELEMENTS OF LOTIC BIOCENOSES AS INDICATORS UNDER ROMANIAN CONDITIONS (IN RUMANIAN),
Bucharest Univ. (Rumania).
For primary bibliographic entry see Field 05B.
W73-05187

COMPARATIVE INVESTIGATION OF THE ACCUMULATION OF RUBIDIUM, CESIUM, AND POTASSIUM BY ROACH AND PERCH UNDER NATURAL CONDITIONS (IN RUSSIAN),
Adademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 05B.
W73-05188

BIOLOGY OF CLADOCERA MASS SPECIES IN A BASIN COOLER OF THE KURAKHOVIAN STATE ELECTRIC POWER STATION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
M. F. Polivannaya, and O. A. Sergeeva.
Gidrobiol Zh. Vol 7, No 6, p 42-48. 1971. Illus. English summary.
Identifiers: *Cladocera, Cooler, Electric power plants, Fecundity, Kurakhovian, Mass, Species, Temperature, USSR, *Thermal pollution.

Dynamics of quantity, size composition and fecundity of 4 mass species of Cladocera are shown in connection with water temperature in the basin of a basin-cooler of the Kurakhovian state electric power station.--Copyright 1972, Biological Abstracts, Inc.
W73-05189

SPECTROPHOTOFLUORIMETRIC ASSAYS AND FLUORESENCE-MICROSCOPIC OBSERVATIONS OF 3,4-BENZOPYRENE ON ORGANS AND TISSUES OF CARASSIUS AURATUS (IN ITALIAN),
Bologna Univ. (Italy). Instituto di Zoplogia.
For primary bibliographic entry see Field 05A.
W73-05200

5D. Waste Treatment Processes

THE IMPACT OF PUBLIC WATER UTILITY PRICING POLICY ON INDUSTRIAL DEMAND AND REUSE,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 06D.
W73-04553

REMOVAL OF SURFACE INACTIVE SUBSTANCES BY FOAM SEPARATION PROCESSES,
Ohio State Univ., Columbus. Water Resources Center.
A. J. Rubin.
Available from National Technical Information Service as PB-214 510, $4.50 in paper copy, $0.95 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report No 363X, 1972. 50 p, 24 fig, 29 ref. OWRR A-013-OHIO (2).

Descriptors: *Foam separation, *Flotation, *Waste water treatment, Coagulation, Foam fractionation, Colloids, Foaming, *Lead, *Zinc, *Iron, *Copper, Illite, Hydrolysis.
Identifiers: Microflotation, CTAB, Sodium lauryl sulfate, Aluminum sulfate, B. cereus, Colloid flotation, Titanium dioxide, Metal ions, Precipitate flotation.

The major findings of an extensive laboratory investigation on the removal and use of hydrolyzable metals in foam separations are described in terms of the aqueous chemistry of the metals ex-

amined. These me
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REPORT ON
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SOD I67.13/3:11,
Research Series,
fig, 61 tab, 10 a
12/67, 14-12-65.

Descriptors: *S
*Overflow, *Sto
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United States, S
Water utilization,
Identifiers: *Com

The effects and
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THERMAL P
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1973. 73 p, 6 fig,
032-NMEX (1).

Descriptors: *T
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Identifiers: *A
*Sensible heat,
function, Energy

The reduction
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amined. These metals included iron (III), zinc (II), copper (II) and lead (II) and the surfactant collectors were lauric acid, sodium lauryl sulfate, stearylamine, and CTAB. Aluminum sulfate was used as the coagulant for the sol studies with B. cereus, illite and titanium dioxide. Solution and operating variables that were studied included gas flow rate, pH, ionic strength, temperature, surfactant type, and collector and coagulant concentrations. Solution pH was found to be the single most important variable affecting the process. In general, the strongly ionized collector surfactants are more effective than the weak acid or base types. As compared to ion removal by foam fractionation or the colloid flotation of discrete particles the precipitate flotation of condensed metal hydroxide or the microflotation of coagulated particles was found to be more efficient and much less dependent on most of the variables examined.
W73-04557

REPORT ON PROBLEMS OF COMBINED SEWER FACILITIES AND OVERFLOWS 1967.
American Public Works Association, Chicago, Ill. Research Foundation.

Available from the National Technical Information Service as PB-214 469, also available from SOD I67.13/3:11, $1.00. Water Pollution Control Research Series, WP-20-11, Dec 1, 1967. 189 p, 10 fig, 61 tab, 10 append. FWPCA Program 1120--12/67, 14-12-65.

Descriptors: *Sewerage, *Sewage treatment, *Overflow, *Storm drains, *Alternate costs, Sewers, Sewage effluents, Sewage districts, United States, Storm runoff, Costs, Land use, Water utilization, Water pollution control.
Identifiers: *Combined sewers.

The effects and means of correcting combined sewer overflows and separate storm and sanitary sewer discharges were inventoried on a national basis in 1967 and compiled. On-site personal interviews with the public officials of approximately 900 communities in the United States collected over 250,000 pieces of data which have been analysed and grouped by State, river basin, and population group to define the problems of combined sewer facilites and overflows. Nationwide projections were made for major items of interest, including area and population served by combined sewers, overflow locations, type and number of regulators, associated land and water uses, estimates of costs for sewer separation by States, alternate control and/or treatment methods and consideration of other aspects of the overall problem. Findings, conclusions and recommendations are presented in summary form. (EPA abstract)
W73-04566

THERMAL POLLUTION REDUCTION BY ADIABATIC DEGASSING,
New Mexico State Univ., University Park. Water Resources Research Inst.
D. B. Wilson, H. Taso, and A. B. Garcia.
Available from the National Technical Information Service as PB-214 650, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 019, 1973. 73 p, 6 fig, 7 tab, 33 ref, 4 append. OWRR-A-032-NMEX (1).

Descriptors: *Thermal pollution, *Pollution abatement, *Thermodynamics, *Tertiary treatment, *Heat transfer, *Model studies, Heat, Thermodynamic behavior, Enthalpy, Water chemistry, Energy, Latent heat, Temperature, Equilibrium, Entrainment, Chemical potential.
Identifiers: *Adiabatic degassing, *Fugacity, *Sensible heat, Excess enthalpy, Material balance function, Energy balance function.

The reduction of thermal pollution by means of adiabatic degassing was studied by using a computer simulation of the process. The systems studied were hydrogen sulfide, ammonia, and sulfur dioxide in water. Each system was studied separately as aqueous unsaturated solutions. These systems are characteristic of possible thermal pollution streams, e.g. hydrogen sulfide and ammonia in water are both products of refinery operations as well as municipal sewage treatment plants; the sulfur dioxide in water would arise in power station flue gas scrubbing operations or in smelter flue gas scrubbing operations. The results indicate that there is a range of gas concentrations for which adiabatic degassing would be an efficient means of reducing thermal pollution, provided there is available a supply of low cost, low pressure steam. (Creel-New Mexico)
W73-04632

REMOVAL OF ORGANIC AND EUTROPHYING POLLUTANTS BY CHEMICAL-BIOLOGICAL TREATMENT.
Notre Dame Univ., Ind. Dept. of Civil Engineering.

Available from the National Technical Information Service as PB-214 628, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency Report EPA-R2-72-076, April 1972. 129 p, 25 fig, 13 tab, 64 ref, 4 append. EPA-WQO Project No. 17010 DTG.

Descriptors: *Waste water treatment, *Activated sludge, *Chemical precipitation, *Nitrification, *Dentrification, Biological treatment, Tertiary treatment.
Identifiers: *Advanced waste water treatment, *Phosphorus removal, Pilot plant, Evaluation.

The principal objective was to demonstrate, on a pilot plant scale (65,000 gallons per day) that a combined biological-chemical treatment scheme can effectively remove organic carbon, phosphorus and nitrogen from wastewater. The treatment scheme consisted of: (1) organic carbon removed by activated sludge type processes, (2) phosphorus removal by chemical precipitation with aluminum, and (3) nitrogen removal by biological-denitrification techniques. Process design loading factors developed were: for nitrification, 0.09 plus or minus 0.03 mg ammonia nitrogen nitrified per day per mg mixed liquor volatile suspended solids (MLVSS) at a pH of 7.5 and temperature of 18 deg C, and for denitrification, 0.06 plus or minus 0.02 mg of nitrite and nitrate nitrogen denitrified per day per mg MLVSS at a pH of 7.6 and temperature of 17 deg C. Final effluent total phosphorus residuals of approximately 1.0 mg/l were achieved using an aluminum to phosphorus molar ratio of 1.2 to 1.0. The total cost of wastewater treatment was estimated to be approximately 2.0 - 2.5 times that of conventional secondary treatment, at a flow of 10 MGD, with the addition of the nitrogen and phosphorus removal processes studied. (EPA)
W73-04636

AN AUTOMATIC SYSTEM FOR THE CONTINUOUS DETERMINATION OF ORGANICS IN WATER AND WASTEWATER,
For primary bibliographic entry see Field 05A.
W73-04693

REMOVAL OF METAL IONS BY SOIL,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 05A.
W73-04694

TREATMENT OF TEXTILE DYEING WASTES BY DYNAMICALLY FORMED MEMBRANES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
C. Aurich, C. A. Brandon, J. S. Johnson, Jr., R. E. Minturn, and K. Turner.
Journal Water Pollution Control Federation, Vol 44, No 8, p 1545-1551, August 1972. 6 fig, 10 ref.

Descriptors: *Waste water treatment, *Reverse osmosis, *Textiles, *Dyes, Filters, Membranes, Temperature, Hydrogen ion concentration, Separation techniques, Cotton, Thermal properties, Physical properties, Conductivity, Industrial wastes, Carbon.
Identifiers: Nylon, Polyesters, Polyacrylates, Zirconium oxide, Total organic carbon.

Experiments using hyperfiltration (reverse osmosis) were conducted with process effluents from the dyeing and finishing of cotton-polyester, cotton, and nylon textiles. Two types of membrane systems were used. One type was formed of feed constituents on supports having pore sizes of 0.025 and 0.45 microns. The second type was a dual-layer, hydrous zirconium oxide/polyacrylate membrane with pore size about 0.45 microns. Filtration efficiency was measured by conductivity to indicate electrolyte removal and by organocarbon reduction, measured by a total carbon analyzer. Effects of temperature and pH were studied. Raising the temperature from ambient to 50C decreased the efficiency of the filters slightly. The adjustment of the pH from 13 to 10 in the cotton desizing and scouring waste improved the filter efficiency. These preliminary results showed the zirconium oxide/polyacrylate filter was better than the membrane formed of feed constituents. Further development of a practical membrane support module is needed. It was not determined if the product water from the hyperfiltration process could be reused without further treatment. (Pestel-Battelle)
W73-04695

TEMPERATURE EFFECTS ON GROWTH AND YIELD OF ACTIVATED SLUDGE,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W73-04698

RESEARCHES ON REMOVAL OF COLLOIDAL MATTER FROM WASTE WATER PRODUCED IN SANITARY PORCELAIN WARE AND CERAMIC INDUSTRY,
Institutul de Studii si Cercetari Hidrotehnice, Bucharest (Rumania).
M. Mihail.
Water Research, Vol 6, No 8, p 951-958, August 1972. 7 fig, 1 tab.

Descriptors: *Waste water treatment, *Coagulation, *Sedimentation, *Centrifugation, *Industrial wastes, Water pollution treatment, Flocculation, Suspended solids, Colloids, Effluents, Turbidity, Sedimentation rates, Methodology, Water purification.
Identifiers: *Porcelain ware industry, *Ceramics industry, Alum, Plyceramics industry, Lime, Separan, Proestol, Polyacrylamide, Faience.

Waste waters from sanitary ware, ceramics, faience and stone-ware industries were tested for the removal of colloidal and suspended solids by equiescent settling, chemical treatment with coagulants, and by centrifugation. Natural sedimentation (.1 m/hr) removed 75-92 percent of the suspended solids from the effluents of the sanitary ware industry, where 130-180 kg of solids are released per ton of product. 100-200 mg/l alum was necessary to reach a turbidity standard of 15-40 mg SiO2/l. Seventy to eighty percent removal was obtained by natural sedimentation of effluents from the plyceramics industry where 30-116 kg of suspended solids are released per ton product. An optimum dosage of 400 mg/l alum was necessary to fall within the turbidity range above. Settlement of suspended solids from effluents from faience and stone ware manufacture (1.2 - 4.5 kg suspended solids/ton product) was favored by gen-

tle stirring and natural sedimentation (75-98 percent) while optimum coagulant dosage varied from 300-400 mg/l alum. Centrifugal treatment showed that slow speeds were highly influential on solids removal while higher speeds were less important. (Mackan-Battelle)
W73-04715

BIOCHEMICAL OXIDATION OF VOLATILE ORGANIC ACIDS BY ACTIVATED SLUDGE,
Gifu Coll. of Pharmacy (Japan). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 05B.
W73-04722

STATISTICAL EXPRESSION OF EFFLUENT QUALITY STANDARDS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W73-04732

SEWER CONTROL AND PLANT AUTOMATION,
Watermation Inc., St. Paul, Minn.
J. J. Anderson.
Water Research, Vol 6, No 4/5, p 611-615, April/May 1972. 3 fig, 9 ref.

Descriptors: *Automation, *Sewers, *Control systems, Runoff, Treatment facilities, Computers, Monitoring, Rainfall, Analytical techniques, Water analysis, Chemical analysis, Chemical oxygen demand, Water quality, Flow rates, Automatic control.
Identifiers: Process control.

An automated sewer control system in Minneapolis-St. Paul is described. The control system uses computer operated inflatable rubber dams and cylinder operated gates in major sewers. The leased-line computer system also connects to sewer level measurements, rain gauges, river quality monitors, and gate position indicators. The computer can take 140 measurements and control 40 gates. Average daily flow, strength, and daily flux of COD and their relation to process control are discussed. (Mortland-Battelle)
W73-04737

TANK FOR THE PURIFICATION OF WASTE WATER,
J. C. Stengelin.
U. S. Patent No. 3,687,299, 4 p, 2 fig, 1 ref; Official Gazatte of the United States Patent Office, Vol 901, No 5, p 1658, August 29, 1972.

Descriptors: *Patents, *Water purification, *Waste water treatment, Equipment, *Sludge disposal, Mud, Abatement, Pollution abatement, *Water quality control, *Water pollution control, Water treatment.

The tank for the purification of waste water has a sludge remover which rotates about an axis placed above the waste water level and is guided along the semicircular tank bottom. The sludge remover includes a scoop bucket adapted to the width of the tank. A suction pipe is connected to the bottom of the scoop bucket. Sediment such as sludge or mud are conveyed during the rotary movement of the scoop bucket through this point to a drainage duct lying above the waste water level. (Sinha-OEIS)
W73-04934

APPARATUS FOR SEDIMENTATION OF SOLID IMPURITIES FROM LIQUIDS,
J. Rozkydalek.
U. S. Patent No. 3,687,298, 6 p, 7 fig, 1 ref; Official Gazatte of the United States Patent Office, Vol 901, No 5, p 1658, August 29, 1972.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, *Sedimentation, Waste treatment, *Solids, Equipment, Hydraulic properties, *Coagulation, *Abatement, Pollution abatement, Water quality control, Water pollution control.

Contaminated liquid is caused to follow an inclined path and to pass alternately through laminar flow areas where settling of solids takes place, and through turbulent flow areas where agglomerating of finer particles, particularly under dosing of chemical coagulants, occurs. The apparatus comprises separate compartments having identical cross sectional areas and conforming oblique bottoms. The compartments are installed one above another in a common enclosure and are interconnected by means of overflow gaps defined by overlapping bottom sections. The waste liquid is admitted to the uppermost compartment and the clarified liquid portion is discharged from the top parts of the single compartments towards a common take-off level. (Sinha-OEIS)
W73-04935

METHOD OF CONDUCTING WASTE LIQUID BY VACUUM THROUGH LONG CONDUITS OF PNEUMATIC SEWAGE DISPOSAL SYSTEMS,
Aktiebolaget Electrolux, Stockholm (Sweden). (assignee).
S. A. J. Liljendahl.
U. S. Patents No 3,686,693, 6 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 5, p 1515, August 29, 1972.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, Equipment, *Aeration, Conduits, *Sewage treatment, *Sewage effluents, Sewers.

The object is to dampen the forces produced in a long main conduit of a pneumatic sewage system when a long liquid column suddenly stops. This is accomplished by mixing air with waste liquid before such liquid is discharged into the long main conduit. The air mixed with the waste liquid functions as a resilient damper that effectively absorbs the forces developed when the column of liquid in the main conduit stops. (Sinha-OEIS)
W73-04938

WATER TREATMENT APPARATUS,
T. A. Stehlin.
U. S. Patent No. 3,686,092, 4 p, 5 fig, 4 ref; Official Gazatte of the United States Patent Office, Vol 901, No 4, p 1385, August 22, 1972.

Descriptors: *Patents, Water treatment, Equipment, *Electrolytes, *Anodes, *Metals, Treatment, Magnesium, *Waste water treatment.

The apparatus for a self-energizing electrolytic water treatment system can be built by using an iron housing which has an inlet chamber that is in communication with two separate treatment chambers. Both treatment chambers are connected to an outlet. A spool valve is provided in the inlet valve chamber for directing fluid flow through one or the other of the treatment chambers. The treatment chamber contains replaceable anodes of a metal such as magnesium which are in electrical contact with the housing. (Sinha-OEIS)
W73-04939

SPLASH SURFACE AERATOR,
AeroChem Research Labs., Inc., Princeton, N. J. (assignee).
H. F. Calcote.
U. S. Patent No. 3,685,810, 5 p, 9 fig, 2 tab, 13 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1328, August 22, 1972.

Descriptors: *Patents, *Aeration, *Aerobic treatment, Liquid wastes, *Sewage treatment, Equipment, Abatement, Pollution abatement, Water quality control, Water pollution control, *Waste water treatment.

The surface of a body of water is subjected to impingement so that the liquid in the area is caused to splatter. Splattering is said to substantially increase the gas liquid interface and hence facilitates absorption of gas in the liquid. The process is particularly useful for aerating water by replenishing the oxygen supply to be used in the breakdown of waste material. The size and shape of the splasher will vary, depending upon the type of drive mechanism. Best results are obtained when the splasher head impinges the surface perpendicular to it. (Sinha-OEIS)
W73-04940

RECIRCULATING OZONE TREATMENT APPARATUS,
R. J. Schaefer.
U. S. Patent No. 3,685,656, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1292, August 22, 1972.

Descriptors: *Patents, *Waste water treatment, Abatement, Equipment, Treatment, Water quality control, Water pollution control, Liquid wastes, *Ozone, *Oxidation, *Reduction (Chemical), Pollution abatement, *Industrial wastes, *Chemical wastes.

A closed system is provided for treating contaminated liquids by oxidation and reduction. The duration or extent of exposure and mixing with ozone can be varied and controlled. Venturies mix ozone with contaminated liquid and discharge the mixture into a treatment tank. A holding tank is connected to and receives liquid from the treatment tank and a portion of this liquid is recirculated through the venturies and treatment tank. (Sinah-OEIS)
W73-04942

WASTE TREATMENT WITH MICROBIAL NUCLEOPROTEIN FLOCCULATING AGENT,
R. A. Bomstein.
U. S. Patent No. 3,684,706, 3 p, 7 ref; Official Gazette of the United States Patent Office, Vol 901, No 3, p 1070, August 15, 1972.

Descriptors: *Patents, *Industrial wastes, *Flocculation, Organic wastes, Silica, Slimes, Abatement, Treatment, *Sewage sludge, Clay, Soil, Suspended solids, *Waste treatment, Pollution abatement.
Identifiers: Taconite tailings, Inorganic wastes.

Suspended inorganic and organic wastes such as phosphatic slimes, silica, taconite tailings, soybean wastes, sewage sludge, clay and soil may be treated with the flocculating agent, a nucleoprotein sol. This microbial flocculating agent is prepared by treating microbial material with an alkaline material. Nine examples of satisfactory use of this agent are presented. The agent may be added in amounts of one part per million. The preferred range is from 1 to 500 ppm based on the total weight of the waste containing aqueous medium. (Sinha-OEIS)
W73-04946

APPARATUS FOR THE BIOLOGICAL PURIFICATION OF WASTE WATER,
Tatabanyai Szenbanyak (Hungary).
E. Abraham, and L. Tasfi.
U. S. Patent No 3,682,313, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 2, p 542, August 8, 1972.

Descriptors: Patents, *Waste water treatment, *Biological treatment, *Oxygenation, *Aeration, Water purification, Settling tanks, Water quality control, Water pollution control, Activated sludge.

Apparatus consists of an oxygenating tank, and a settling tank with a hollow enlongated device in the oxygenating tank. A conduit conveys the blended mixture of sludge and water from the ox-

ygenated tank to the settling tank. Another conduit returns settled sludge to the oxygenating tank. The recycling of the sludge is accomplished without a pump unit. The oxygenation tank has a turbine wheel near the surface of the water. As a result of the intense motion sucked in air contacts the liquid in the form of fine air droplets. The amount of oxygen introduced favors the biological purification of waste water. (Sinha-OEIS)
W73-04951

CONTINUOUS ION EXCHANGE APPARATUS AND METHOD OF OPERATING THE SAME,
Paterson Candy International Ltd., London (England). (assignee).
D. G. Stevenson.
U. S. Patent No 3,682,312, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 901, No 2, p 542, August 8, 1972.

Descriptors: *Patents, *Ion exchange, *Resins, Equipment, *Waste water treatment, Water purification.

This invention comprises a multi-stage open ion-exchange column and a multi-stage closed regenerator column and a means for withdrawing mixed resins from the lower part of the ion exchange column. The mixed resins are withdrawn and conveyed to an air cavity at the top of the regenerator column. The regenerator column is positioned at a lower level than the ion-exchange column so that the resins flow by gravity from the latter to the former. (Sinha-OEIS)
W73-04952

APPARATUS FOR LIQUID WASTE TREATMENT AND MEANS FOR STRIPPING SAME,
J. M. Valdespino.
U. S. Patent No 3,682,310, 4p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 2, p 541, August 8, 1972.

Descriptors: *Patents, *Waste water treatment, Liquid wastes, Abatement, Pollution abatement, Equipment, *Filtration, Centrifugation, *Filters, *Drums, Water pollution control, Water quality control.

The apparatus consists of a centrifuge filter having a rotatable filter drum with perforated walls along its periphery. The drum acts as a centrifuge when rotated. An air stream is intermittently directed against material accumulated on the filter medium for loosening it. A vacuum may be used to remove loosened material for periodic cleaning of the filter. A fluid stream may be used for the same purpose. The air stripping jet is adapted to move closer to the periphery wall of the centrifuge drum and a novel combination vacuum seal and brake is provided for the drum. (Sinha-OEIS)
W73-04953

OZONE SEWAGE TREATMENT APPARATUS,
R. J. Schaefer.
U. S. Patent No 3,680,704, 3 p, 2 fig, 4 reg; Official Gazette of the United States Patent Office, Vol 901, No 1, p 154, August 1972.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, Treatment, *Ozone, Abatement, Pollution abatement, Water quality control, Water pollution control.

An ozone contact chamber is connected to a title field with a vent to the atmosphere at a point remote from the connection to the chamber. Ozone is produced in compressed air which is discharged into sewage effluent in the chamber and passes through the tile field and vent to the atmosphere to treat the sewage in both the chamber and the tile field. (Sinha-OEIS)
W73-04954

PROCESS FOR THE TREATMENT OF SLIMES AND WASTE SOLIDS,
Occidental Petroleum Corp., Los Angeles, Calif. (assignee).
T. Liu, and D. R. Stern.
U. S. Patent No 3,680,698, 8 p, 2 fig, 6 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 153, August 1, 1972.

Descriptors: *Patents, *Suspended solids, *Slime, *Waste treatment, *Solid wastes, *Flocculation, *Coagulation, *Gypsum, Abatement, Pollution abatement, Water quality control, Water pollution control.

In this process a prepared liquid coagulant reaction mass is added and accompanied by high shear agitation, in at least one stage to flocculate solids and allow the partially compacted mass to settle. Additional liquid may be extracted from the compacted mass by slowly agitating it while in contact with a porous filter, preferably sand. It is suggested that gypsum may be added with the coagulant reaction mass to promote flocculation. Aging a fresh liquid containing suspended solids will reduce the amount of coagulant needed. (Sinha-OEIS)
W73-04955

HOW TO RECYCLE RUNOFF,
C. Coleman.
World Irrigation, Vol 10, No 3, p 20-24, April, 1970. 2 fig.

Descriptors: *Water reuse, *Irrigation practice, *Irrigation efficiency, *Water conservation, Waste water, Water control, Water loss, Water pollution control, Irrigation engineering.
Identifiers: *Pump back systems, Irrigation automation.

The reuse of water is getting much attention in the United States today. One area that seems to show promise is that of recycling tailwater runoff in irrigated areas. By installing a collection pond and a pump back system it seems that irrigation efficiencies of 80 percent or greater are entirely possible. By not allowing water to waste off the end of the field the problem of silt and nutrient pollution in the streams could be greatly reduced. Also, in areas where urban development borders on agricultural land the legal problems associated with waste water could be eliminated. (Skogerboe-Colorado State)
W73-04977

DISPOSAL OF MUNICIPAL WASTE WATER THROUGH FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
W. E. Sopper.
Environ Pollut. Vol 1, No 4, p 263-284. 1971. Illus.
Identifiers: *Water reuse, Municipal wastes, *Waste water disposal, Crops, Fiber, Forests, Irrigation water, Reservoirs, Wood.

Serious pollution problems are often created by the disposal of municipal waste water into surface waters. An obvious alternative method is diversion of these waste waters to the land. Such non-aqueous methods of disposal might eliminate or alleviate many water pollution problems and, in some cases, could even provide secondary benefits such as recharge of groundwater reservoirs, and increased production of crops and wood fiber. Research results indicate that, with properly programmed application rates, large volumes of waste water can be satisfactorily renovated through irrigation of forestland, and considerable amounts of high-quality water recharged to the ground-water reservoir. In addition, secondary benefits such as increased tree growth, increased site productivity, and site amelioration were also obtained. The deliberate reclamation of waste water for potential reuse is one of the keys to optimum utilization of water resources.–Copyright 1972, Biological Abstracts, Inc.

W73-04982

A STUDY OF THE COST OF WASTEWATER TREATMENT TO WET-PROCESS TEXTILE MANUFACTURING PLANTS IN SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Agricultural Economics and Rural Sociology.
M. B. Richardson.
Ph.D. Dissertation, December 1971. 114 p, 14 tab, 47 ref, 2 append. OWRR-A-017-SC (7).

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, *Municipal wastes, *Waste treatment, *Cost comparison, Cost analysis, Economics, Cost-benefit ratio, Joint costs, Water pollution sources, Water quality, *South Carolina.
Identifiers: *Textile plant wastes, *Combined waste treatment.

The economic desirability was determined of treating textile wastewaters in a firm-owned and operated treatment facility or arranging with a municipality to have the textile wastes treated jointly with domestic wastes in the municipal treatment plant. Waste treatment costs were related to the production costs of four textile manufacturing plants and in no instance did annual waste treatment costs equal 1 percent of annual production costs. Of the six plants subjected to a cost comparison between firm-owned facilities and municipal facilities, three textile mills would save money by combined waste treatment under any of the charge schedules postulated. In general, analyses of industrial wastewater treatment alternatives must be made on an individual basis. (Smith-Texas)
W73-05012

FARM ANIMAL WASTE MANAGEMENT.
For primary bibliographic entry see Field 05G.
W73-05013

DESIGN OF INDUSTRIAL WASTE TREATMENT PLANTS,
Flour Nederland, Haarlem.
A. M. M. Buysse, R. A. Beardsley, and S. J. Thomson.
Water Research, Vol 6, p 377-380, 1972.

Descriptors: *Treatment facilities, *Design criteria, *Industrial wastes, Effluents, Waste water treatment, Ultimate disposal, Water reuse, Solid wastes, Heavy metals, Nutrients, Monitoring.

The design criteria of an industrial waste treatment plant depends on the waste water contaminants and the optimization of the design is strictly an evaluation of the operating cost against the capital investment. Some important design criteria are: (1) segregation of influent streams, (2) elimination or reuse of wastewater, (3) methods of free oil removal, (4) amount of BOD-COD to be removed, (5) amount of nutrient removal, (6) removal of heavy metals, (7) removal of dissolved solids, and (8) methods of ultimate disposal of solid wastes. Operating variables to be considered are: (1) hydraulic loading of the system in all conditions, (2) backup units for primary and secondary treatment, and (3) control of temperature in effluents. (Smith-Texas)
W73-05014

TWO-STOREYED FINAL SEDIMENTATION TANKS,
Baubehorde (West Germany). Hauptabteilung Stadtenwasserung.
I. Kleffner.
Water Research, Vol 6, p 433-435, 1972. 3 fig.

Descriptors: *Settling basins, *Sedimentation, *Sludge treatment, Capital costs, Operating costs, Cost analysis, Economics, *Waste water treatment.

Identifiers: Band scrapers.

Two-storeyed sedimentation tanks require less land area but need endless band scrapers and scum removal prior to sedimentation. Construction costs on a per volume basis are lower than standard sedimentation tanks of comparable performance and operating only one scraper at a time doubles the band life and does not affect the effluent. Return sludge concentration increases slightly during simultaneous operation. (Anderson-Texas)
W73-05016

DESCRIPTIVE MODEL OF A SHIPBOARD ECOLOGICAL SYSTEM,
Naval Postgraduate School, Monterey, Calif.
J. O. Miner.
Available from the National Technical Information Service as AD-743 764, $3.00 in paper copy, $0.95 in microfiche. Master's Thesis, June 1972. 64 p, 6 fig, 20 ref.

Descriptors: *Ships, *Sewage treatment, *Waste disposal, *Waste water treatment, Sewage effluents, Waste storage, *Simulation analysis, Stochastic processes, Computer models, Sanitary engineering, Model studies.
Identifiers: *Shipboard sewage processing.

Two computer simulations employing Monte Carlo analysis were developed to describe the generation of sewage and to help solve the problem of economically processing sewage on board Naval ships. A non-homogeneous Poisson process was the basis of simulation one and an empirical distribution describing the arrival behavior of sewage to the holding processing unit over a 24 hour period was applied to known data on sewage generation in simulation two. Results of the two simulations were compatible with one another. The simulations indicated that a revision of the Navy's design parameter for the daily per capita sewage generation rate was in order, and also pointed out a feasible combination of holding tank capacity, processor rate and processing policy. The simulations were designed so that use by others with their own data would be easy. (Smith-Texas)
W73-05017

INDUSTRIAL AND AGRICULTURAL SOLID WASTES AND PROBLEMS INVOLVED IN THEIR DISPOSAL,
Bureau of Solid Waste Management, Cincinnati, Ohio.
T. J. Sorg.
Public Health News, Vol 51, No 6, p 67-69, March 1970. 2 ref.

Descriptors: *Industrial wastes, *Agricultural runoff, *Waste water treatment, *Waste disposal, *Reclaimed water, *Solid wastes, Technology, Federal Government, Economy, Automation, Research and development.
Identifiers: Demonstration programs.

The composition of industrial wastes varies widely from industry to industry and hence they are difficult to treat by conventional municipal waste treatment plants. Various surveys of industrial wastes are being carried out by the Bureau of Solid Waste Management in hopes of providing information for industrial treatment. Industries are now beginning to look at the potential of reclaiming their waste products to offset higher waste management and raw material costs. The amount of agricultural waste produced exceeds the solid waste production from any other segment of the economy. The trend in livestock, milk, poultry, and egg production is toward automation and centralization. As a result the size of the operation does offer economy in management, but has outraced the present technology and ability to collect and handle the wastes. Increased effects are needed in industrial and agricultural solid waste management through more research and development programs, along with the application of existing technologies through technical assistance and demonstration programs or education and awareness programs. (Morparia-Texas)
W73-05018

LIQUID/SLUDGE INCINERATOR.

Chemical and Process Engineering, Vol 53, No 7, p 43, July 1972.

Descriptors: *Waste disposal, *Waste treatment, *Incineration, Evaporation, Sludges, Sludge disposal, Organic wastes.
Identifiers: *Fuel-waste ratios, Circulation.

This newly designed incinerator can handle all heavily polluted organic or chemical waste streams. The water borne effluent is emulsified with any convenient fuel, atomized with air and ignited. Good circulation keeps the temperature uniform at about 1000 deg. C. Several special variations with differing fuel-waste ratios and waste capacities are available. (Anderson-Texas)
W73-05025

TURN-KEY FOR MUNICIPAL SEWAGE TREATMENT PLANT PROJECTS.

Public Works, Vol 103, No 10, p 66-69, October 1972. 2 fig.

Descriptors: *Design criteria, *Municipal wastes, Industrial wastes, *Treatment facilities, Construction, Waste water treatment, Regulation, Legislation, Sewage treatment.
Identifiers: *Turn-key approach.

The common problems of time and responsibility in Municipal Sewage treatment plant projects could easily be solved by the 'Turn-Key' approach, as used in the chemical-industrial field according to the experienced and knowledgeable, but anonymous author. A turn-key firm always tries to develop, design and construct facilities that will meet a client's production or operation requirements with a minimum of excess capacity to spare and at the lowest competitive rates. In current municipal projects, except for the construction phase, each step is separate and distinct, involving one of consulting engineer, Regulatory Authorities, and a contractor. This makes it difficult to pinpoint the party at fault. The author compares in detail both current and turn-key approach for municipal sewage treatment plant projects and recommends the latter. The transition requires changes in both federal and state regulations covering sewage treatment plant design as well as amendments or changes to municipal law in regards to public bidding. The implications of these changes and amendments will bear long and careful consideration before the turn-key approach is implemented for municipal sewage treatment plant projects. (Morparia-Texas)
W73-05026

CONTROL OF ACTIVATED SLUDGE PLANTS,
Technische Hochschule, Vienna (Austria).
W. von Der Emde, and U. Schopper.
Water Research, Vol 6, p 447-449, 1972.

Descriptors: *Organic matter, *Activated sludge, *Dissolved oxygen, *Chemical oxygen demand, *Treatment facilities, Sludge disposal, Design criteria, Waste water treatment.

The decomposition of organic matter and the consumption of oxygen proceed at different rates, hence dissolved oxygen rather than the organic carbon or chemical oxygen demand is used for control. Difficulties occur in lightly loaded plants or when localized oxygen is applied. Sludge removal is not an important consideration for plant efficiency. For design criteria, maximum inflow with a constant sludge return should be assumed. (Anderson-Texas)
W73-05027

CONTROL OF ACTIVATED SLUDGE PLANTS,
West Hertfordshire Main Drainage Authority, Rickmansworth (England).
R. Wood.
Water Research, Vol 6, p 437-440, 1972. 1 fig, 2 tab.

Descriptors: *Activated sludge, *Air circulation, Dissolved oxygen, *Sludge treatment, Automation, Mechanical control, Treatment facilities, Waste water treatment.
Identifiers: *Time intervals.

The air flow at the West Hertfordshire Main Drainage Authority, England, is controlled manually in steps of 12.5% maximum capacity. Control criteria are D. O. in the mixed liquor, sludge density index, and ammoniacal N in the effluent. Air control of the sludge density index is imprecise, but there is clearly no need to automate, or even mechanize the air flow control as adjustments are required only in twelve hour to one month intervals. In future plants, air control steps will be smoothed by blowing off excess air. (Anderson-Texas)
W73-05028

CONTROL OF ACTIVATED SLUDGE PROCESS: APPLICATIONS,
Centre de Recherches de l'Omnium d'Asseinissement, Colombes (France).
P. Brouzes.
Water Research, Vol 6, p 451-454, 1972. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Automation, *Activated sludge, Aeration, *Treatment facilities, *Digital computers, Pulp and paper industry, Industrial wastes, Municipal sewage.
Identifiers: *Computer control.

Computer control of activated sludge is based on the effective respiration rate and theoretical growth rate of the microorganisms. Steady purification performance and an even air distribution is effected by digital computer translation of incoming data from several sensors. Two examples of computer control are offered: (1) a paper pulp mill treatment plant, and (2) a municipal sewage treatment plant. Reduced air costs and consistent purification are cited as advantages. (Anderson-Texas)
W73-05029

COMPOSITION OF THE 'FILTRATE' FROM THERMALLY CONDITIONED SLUDGES,
Berliner Entwasserungswerke, Berlin (West Germany).
F. Sarfert.
Water Research, Vol 6, p 521-525, 1972. 1 fig, 3 tab, 6 ref.

Descriptors: *Heat treatment, *Sludge treatment, *Filtration, Biochemical oxygen demand, Chemical oxygen demand, *Waste water treatment.
Identifiers: *Temperature range.

Over a temperature range of 170-210 deg. C and a reaction time of 30-90 minutes, the composition of sludge filtrate did not vary significantly. However, the filter resistance decreased markedly with increased time and temperature. Heat treatment was found to increase the organic content of the filtrate, as compared to raw filtered sludges, but mixing primarily and secondary sludges minimized this problem. The BOD was 50% lower than raw sludge filtrates while the COD remained about constant. (Anderson-Texas)
W73-05030

DESIGN OF TREATMENT FACILITIES FOR THE CONTROL OF NITROGENOUS MATERIALS,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
Edwin F. Barth.
Water Research, Vol 6, p 481-483, 1972, 2 fig, 2 ref.

Descriptors: *Nitrification, *Biological treatment, *Treatment facilities, *Waste water treatment, Oxygen, Pilot plant, Design criteria.
Identifiers: *Chemical treatment.

In many effluents, it is desirable to provide for nitrification or nitrogen removal. The multiple stage chemical-biological scheme isolates and optimizes each biological transformation and allows the use of chemical aids for increasing the efficiency. Additional advantages are step-wise construction and flexibility. Second stage nitrification can be in a tank or on fixed media. Pure oxygen and air have been used with success. Each case requires judgment to determine which variation is most suitable. (Anderson-Texas)
W73-05031

DEWATERING OF SLUDGE,
Humphrey (Howard) and Sons, Epsom (England).
W. H. Meredith.
Water Research, Vol 6, p 527-529, 1972, 3 tab.

Descriptors: *Dewatering, *Design criteria, *Heat treatment, *Sludge disposal, Heat exchangers, Maintenance costs, Operating costs, *Waste water treatment.
Identifiers: *Chemical conditioning, Heat conditioning.

Economic comparisons of prospective dewatering systems require contractual commitments at an early stage; often so early that unexpected costs occur which change the balance. It was decided to use heat treatment and pressing in this example, but unexpected maintenance costs, particularly clogging in the heat exchanger, raised operating costs substantially. Either a redesign of the heat exchanger or a switch to chemical conditioning is called for instead of this design. (Anderson-Texas)
W73-05032

INFLUENCE OF THE PRESETTLING TANK SIZE ON DIMENSIONING AND COST OF A SEWAGE TREATMENT WITH ACTIVATED SLUDGE,
Technical Univ., Lodz (Poland). Dept. of Civil Engineering.
T. Sedzikowski.
Water Research, Vol 6 , p 341-345, 1972, 5 fig, 8 ref.

Descriptors: *Optimization, *Capital costs, *Activated sludge, Aeration, Operating costs, Cost analysis, Cost comparisons, *Waste water treatment, *Sewage treatment, Economics.
Identifiers: Secondary settlement.

The general expenditures for presettling, aeration, and secondary settlement can be minimized by optimization of the presettling tank size. The aggregate total volume of the presettling tank and aeration tank is determined, using the BOD removal efficiency (derived), various times, and a unit flow rate. This volume enables the calculation of capital costs for the presettling and aeration tanks. Next, an equation is given that yields the electrical power requirements and costs from the concentration of clarified wastes and efficiency of the treatment. The following conclusions are made from the results: (1) the time of preliminary sedimentation influences capital and running costs of sewage treatment; (2) capital costs are lower when the time is less than 0.5 hours; (3) balancing the annual costs from capital and operating costs depends on the raw sewage concentration and on the ratio of the unit costs of capacity to the price of electricity and to a lesser extent on the degree of sewage treatment; (4) the cost balancing time could be the basis for optimization; (5) with a cost balancing time less than 15 years, presettling time more than 0.5 hours is uneconomical; and (6) presettlement does not substantially increase the total degree of sewage treatment. (Morparia-Texas)
W73-05033

ELECTRIC CHARGE SPEEDS WASTE DISPOSAL,
Swift and Co., Oak Brook, Ill. Engineering Research Dept.
O. A. Clemens, and J. V. Ziemba.
Food Engineering, Vol 43, p 47-49, August 1971.

Descriptors: *Waste disposal, *Waste water treatment, *Flocculation, *Industrial wastes, Treatment facilities, Suspended solids, Polymers, Separation techniques.
Identifiers: *Alum, *Polymer flocculants.

Swift and Company introduced a new pollution control system which combines use of special polymer flocculants and impressed electric currents to remove suspended waste. Liquid-waste treatment at Swifts edible oil refinery was termed inadequate, but it was decided that with modification the existing treatment hardware could be more efficient. Flocculants used are alum and a specially formulated long chain polymer with a high molecular weight (10 to 12 million range). After initial oil and water separation, the water is pumped to an air flotation cell. Along the way, alum then polymer are automatically added. The corrodible metal tank (cathode) is circuit-connected to anodes energized by a direct current source. An electron flow is generated between anodes and tank. The impressed current assists the floc because the negative potential on it is lower than the tanks. (Anderson-Texas)
W73-05034

ALUMINUM FLUORIDE FROM WET PROCESS PHOSPHORIC ACID WASTES.

British Chemical Engineering and Process Technology, Vol 17, No 7/8, p 609-610, July/August 1972, 2 fig, 2 tab, 1 ref.

Descriptors: *Phosphorus compounds, *Acids, *Industrial wastes, Recycling, Chemical reactions, Cost analysis, Cost comparison, *Waste water treatment.
Identifiers: *Fluosilicic acid, *Acid wastes, *Aluminum compounds.

A process capable of producing AlF3 from fluosilicic acid solution arising from the scrubbing of the waste gases evolved in the production of phosphoric acid as developed by the Unie Van Kunstmestfabrieken B. V. is summarized. The reactions of this five stage process were explained. This process takes fluosilicic acid solution and hydrargillite (an Al2O3 . 3H2O in the 2 form) as the starting materials. Ammonia is an intermediate carrier and is recycled completely. In addition to the Flow Scheme, the article also gives the tables of variable costs, and distributions of investment according to the process stages and to the engineering aspects of the process plant. (Morparia-Texas)
W73-05035

REGIONAL COOPERATION SOLVES POLLUTION PROBLEMS.
For primary bibliographic entry see Field 05G.
W73-05036

DISSOLVED OXYGEN CONTROL OF ACTIVATED SLUDGE AERATION,
Kennedy Engineers, San Francisco, Calif.
R. A. Ryder.
Water Research, Vol 6, p 441-445, 1972.

Descriptors: *Aeration, *Activated sludge, Capital costs, Mechanization, *Treatment facilities, Automation, Dissolved oxygen, *Waste water treatment.
Identifiers: Flow models.

Diffused air control can be achieved with a sensor connected to the air blowers. With the aid of a D.O. analyzer, a constant aeration profile can be achieved. A simple addition to the control system provides response to both flow and D.O. variations. Mechanical aeration control can be accomplished by submergence control or turbine speed control. In one treatment plant, installation costs were $30,000 with an expected yearly savings of $15,000. (Anderson-Texas)
W73-05037

INVESTIGATION OF THE BENEFITS FROM AUTOMATIC CONTROL OF DISSOLVED OXYGEN IN THE AERATION CHANNELS OF A LARGE ACTIVATED SLUDGE PLANT ACHIEVING FULL NITRIFICATION,
Water Pollution Research Lab., Stevanage (England).
A. B. Wheatland.
Water Research, Vol 6, p 455-456, 1972.

Descriptors: *Automation, *Activated sludge, *Treatment facilities, Aeration, Mechanization, Cost analysis, *Waste water treatment.
Identifiers: Air control.

A twenty-two percent reduction in air resulted from automatic air control at a large activated sludge plant. The effluent was of a similar high quality to that of a standard aeration system. Mechanical aeration is equally adaptable to automatic control. Economy of scale is important as the cost of monitoring equipment is not in proportion to the size of the plant. (Anderson-Texas)
W73-05038

REPEATED USE OF GRANULAR ACTIVATED CARBON IN WASTE WATER TREATMENT,
Chemviron, Mainz-Gonsenheim (West Germany).
H. J. Kampf.
Water Research, (Pergamon Press) Vol 6, p 493-494, 1972.

Descriptors: *Activated carbon, *Heat treatment, Tertiary treatment, Temperature control, Cost comparisons, *Waste water treatment.
Identifiers: *Lake Tahoe, *Thermal reactivation.

Granular activated carbon, which has more capacity than powdered activated carbon, is economical only if regeneration and reuse is possible. Onsite thermal regeneration in a Herreshoff furnace is the usual method. With proper oxygen and temperature control, a 5-7% carbon loss per cycle can be maintained giving a fifteen cycle lifetime for the carbon. At Lake Tahoe, costs are $5.84 per 1000 cu m for tertiary treatment with the product comparable to drinking water. (Anderson-Texas)
W73-05039

WASTE RESTRICTIONS,
Gumm (Frederick J.) Chemical Co., Inc., Kearny, N.J.
L. J. Durney.
Plating, Vol 58, p 759-761, August 1971.

Descriptors: *Phosphates, *Eutrophication, Carbon, Nitrogen, Heavy metals, Aeration, Cost analysis, Domestic wastes, Industrial wastes, Waste water treatment.
Identifiers: Algae blooms, *Waste management.

In defense of phosphate use, Durney cites research from the Woods Hole Oceanographic Foundation that indicates that carbon and nitrogen

are probably the critical factors in algae blooms and eutrophication of lakes. N.T.A., the approved substitute for phosphate, and other chelates, tend to load up with heavy metals more rapidly (than phosphate) and to hold them more tenaciously. This may require additional treatment. An increasing body of information indicates that aeration can reverse the pollution of many streams and lakes at relatively low cost. It is also recognized that a proper combination of domestic and industrial wastes can be successfully treated if proper ratios are maintained. Three outstanding examples of joint ventures between industry and municipalities are cited with regard to the mutual waste problem. (Anderson-Texas)
W73-05040

PRACTICAL EXPERIENCES OF THERMIC SLUDGE DRYING ON THE CENTRAL TREATMENT PLANT OF NEERSEN,
Niersverband, Viersen (West Germany).
T. Wusten, and E. Zingler.
Water Research, Vol 6, p 533-537, 1972, 1 fig, 4 tab.

Descriptors: *Sludge disposal, *Waste disposal, *Sludge digestion, Land reclamation, Fertilizer, Maintenance costs, Temperature control, Waste treatment, Cost comparisons.
Identifiers: *Digestor gas, *Sludge drying.

Most of the sludge from the Neersen sewage treatment plant is sprayed wet on farmland. The remainder is coagulated with lime and aluminum, filtered on a rotary drum, dried in a Hazenmag drier which is fired by digestor gas and sent to a private contractor. Maintenance of the rotary drum filter cloth is an expense, but the major problem has been the drier which has yet to meet the contractor's performance estimates. Inability to maintain the proper temperature and inadequate dust separation in the cyclone are primarily responsible for this failure. The paper concludes that agricultural spraying is much cheaper than drying where possible. (Anderson-Texas)
W73-05042

WIMPEYS INTRODUCE NEW SEWAGE TREATMENT SYSTEM.

Water and Water Engineering, Vol 76, No 919, 1 p, September, 1972.

Descriptors: *Sewage treatment, *Oxygen, Cost comparisons, Odor, Activated sludge, Sludge treatment, Waste water treatment.

Union Carbide Corporation and Geo. Wimpey and Co. announced formation of a joint company to market a new sewage treatment system which utilizes high purity oxygen. It is identified in the U.S. as the Unox System. The use of oxygen in place of atmospheric air provides many basic process improvements while reducing treatment costs. Compact size lowers electric power demand and greater stability under shock loads cut costs. Being a covered system, odor, spray, and other problems are reduced. (Anderson-Texas)
W73-05043

'BLACK CLAWSON OFFERS A MONEY-MAKING SOLID WASTE RECYCLING SYSTEM',
A. W. J. Dyck.
American Paper Industry, Vol 53, No 2, p 46-49, 1971.

Descriptors: *Solid wastes, *Recycling, Capital costs, *Industrial wastes, *Pulp and paper industry, Pulp wastes, Sludge treatment, Sludge disposal, Incineration, Land reclamation, *Waste water treatment.
Identifiers: *Fiber recovery.

Black Clawson Co. now offers to the public a solid waste recycling system, Hydrasposal-Fiberclaim Systems, which promises an annual return of 20% on your investment. Developed by Joe Baxter, Carl Landegger, and the Shartle Division, the cost of the system completely installed is estimated at $10,000/daily ton for a 1,000 tpd plant, and $14,000/daily ton for a 250-300 tpd plant. Black Clawson's field has been secondary fiber recovery, and its Hydrasposal-Fiberclaim System features an upgrading process utilizing an alkaline cook (5-10% Na OH) that should be of value to many paper mills. The system also recovers ferrous materials and grass (in the form of cullet), both of which have a resale market. The system produces no pollution. A final product sludge is incinerated to form ash (3% of total intake), which can be used as soil conditioner or land fill. (Anderson-Texas)
W73-05044

BASIC PROBLEMS IN THE DESIGN OF LARGE TREATMENT PLANTS-ARAKAWA TREATMENT PLANT,
Association of Ara-river Basin-wide Sewage Works, Tokyo (Japan).
S. Tohyama.
Water Research, Vol 6, p 347-350, 1972, 3 fig, 1 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Domestic wastes, Industrial wastes, *Activated sludge, Aeration, Storm water, Design criteria, Automation, Monitoring, Dissolved oxygen.
Identifiers: *Tokyo, Hydrogen ion concentration.

A large growth in population and delays in the improvement of the sewerage system in the Saitama-Tokyo area cause domestic sewage and industrial wastewaters to discharge into the middle stream of the Ara river without treatment. One large treatment plant is planned to serve 8 cities (2 million people) on the left side basin of the river with a drainage area of 200 km2. Treatment is by the standard activated sludge process with the following characteristics: (1) installation of pre-aeration tanks; (2) division of the plant into small units with equal loading to each tank; (3) combination of the unit tanks into a single structure order to minimize hydraulic losses; (4) utilization of one-eighth of the facilities as a monitoring plant; (5) storm water storage tanks; and (6) computer systemization into central monitoring and controlling systems. Equal tank loading is provided by electromagnetic flow meters and valves, and DO and pH meters and lab sample points are located in the monitoring plant. A diagram of the plant layout and cross sections of the aeration and settling tanks illustrate the design of the system. (Morparia-Texas)
W73-05045

TREATMENT PLANTS WITH SMALL QUANTITIES OF SEWAGE DURING THE FIRST PHASE OF OPERATION,
Kocks (F. H.), Duesseldorf (West Germany).
G. Friesecke.
Water Research, (Pergamon Press), Vol 6, p 375-376, 1972.

Descriptors: *Design criteria, *Treatment facilities, *Sewage treatment, Waste water treatment, Cost analysis, Optimization.
Identifiers: *Gutters, *Grit chambers.

It is sometimes necessary to design large treatment plants which at first have to treat no more than 25-30 percent of the design quantities. In most cases, these plants are designed so that they can be extended by adding similar units-inside the same treatment stage-to those already in operation. However, this principle is not applicable for structures like gutters and some grit chambers because of technical and economic reasons. Towns with extradordinary development; especially those influenced by fast growing industries or if mineral resources are disclosed, should consider special design criteria. The cross-sectional design of gutters and the design of grit chambers must provide acceptable hydraulic conditions like trapezoid or triangular sections for gutters, and optimum time of flow in every grid chamber. Gutters for rectangular aeration and settling basins should allow installation of provisional dividing and guide walls along with minimum filling heights. Each unit and stage of treatment should be able to operate individually or combined with other units and stages. If necessary, more than one mode of treatment for the one design should be possible. (Morparia-Texas)
W73-05046

PH NEUTRALIZATION PROCESS CONSIDERATIONS,
Foxboro Co., Mass.
E. T. Williams.
Plating, Vol 58, p 967-970, October, 1971, 2 fig, 1 tab, 7 ref.

Descriptors: *Industrial wastes, *Biological treatment, Chemical reactions, Optimization, Mixing, Cost analysis, *Waste water treatment, Cost comparisons.
Identifiers: *Hydrogen ion concentration, Reagent selection, Chemical treatment.

Problems in controlling pH to achieve optimum performance stem more from process considerations than from within the control system. Reagent selection criterion is presented with a tabled basicity factor, where all reagents are reduced to the common denominator of lime. Optimum costing conclusions are then drawn. Comparison between reaction rate and reaction vessel size is discussed with the use of sequenced equal-percentage value offered as a solution when there is a two or greater pH rangeability in the influent. Buffering factors in the waste and point of application of the reagent are discussed. Mixing techniques and pitfalls are secondary considerations in optimizing time and maximizing controls. Tank size should be based on the reaction rate and in a well mixed system the retention time should be just long enough for the reaction to go to completion. Measurement interference and locations and control systems with a nonlinear controller complete the study. (Anderson-Texas)
W73-05047

NEW BLACK ALLPIAS BALLS FOR FLOATING BLANKETS.

Water and Water Engineering, Vol 76, No 919, 1 p, September, 1972.

Descriptors: *Odor, *Algae, Growth rates, Oxidation, *Evaporation control, Waste water treatment, Plastics.
Identifiers: *Heat loss control, Carbon black.

Allplas augments its hollow plastic ball line with the new Allplas Black. The new ball is made of low-density polythene with a 2-5% admixture of carbon black, which renders the material resistant to the ultraviolet component in daylight. The ball is blow-molded in one part, but with the patented integral circumferential rim retained. One size--of 45 mm (1 3/ in.') diameter-- is available, in minimum quantities of 100,000. Virtually indestructable, a single Allplas layer has a proven ability to reduce by 98.2% the smell emanating from any liquid, eliminates algal growth, reduces rate of oxidation of liquids and heat loss and evaporation. (Anderson-Texas)
W73-05049

SYSTEM STUDY, VACUUM SEWAGE COLLECTION.
Hittman Associates, Inc., Columbia, Md.

Available from the National Technical Information Service as AD-744 339, $3.00 in paper copy, $0.95 in microfiche. Final Report Number HIT-510, December, 1971. 110 p, 12 fig, 11 tab, 2 append. N62399-71-C-0008.

Descriptors: *Sewage, *Sewers, *Sewage effluents, Sanitary engineering, Wastes, Waste storage, Water conservation, Water loss, Plumbing, Cost analysis, Cost comparisons, Capital costs, Repairing, Cost-benefit ratio, Waste water treatment.
Identifiers: *Navy advanced bases, *Vacuum sewer systems, *Gravity sewer systems, Waste collection.

Gravity sewer systems and vacuum sewer systems for use in Navy advanced bases were compared for effectiveness and cost. A vacuum system using low flush water toilets and vacuum transport of the combined wastes was selected for evaluation. The effectiveness of both gravity and vacuum sewer systems was evaluated on the basis of (a) system reliability, (b) operational requirements, (c) maintenance requirements, (d) installation requirements, (e) ease of repair, (f) terrain conditions, (g) susceptibility to attack, (h) size and weight, and (i) space requirements. Cost estimates were also prepared for both systems. It is concluded that vacuum sewer systems offer improved design flexibility under adverse site and construction conditions. (Smith-Texas)
W73-05050

THE ECONOMIC FEASIBILITY OF TREATING TEXTILE WASTES IN MUNICIPAL SYSTEMS,
Clemson Univ., S.C.
K. D. Newlin.
Journal of the Water Pollution Control Federation, Vol 43, No 11, p 2195-2199, November, 1971, 20 ref. OWRR-A-017-SC (6).

Descriptors: *Textiles, *Industrial wastes, *Waste treatment, *Cost analysis, Cost comparison, Treatment facilities, Domestic wastes, *Waste water treatment, Economics, Economic feasibility, Biochemical oxygen demand, Biological treatment.
Identifiers: Muncipal wastes treatment, Plant efficiency.

This study was undertaken to determine the economic feasibility of treating industrial wastes in municipal wastewater treatment plants and to dispel the increasing concern about the effects of industrial wastes on municipal systems. Specifically, textile wastes should lend themselves to bacteriological decomposition as a method of treatment if the pH is not too high or low and if appropriate nutrients, which can be supplied by domestic wastes, are present, because textile wastes have a very high B OD and are in carbonaceous content. Although there is no simple solution to the problem of treating textile wastes and estimating the associated costs, it seems they can be treated economically, according to the literature reviewed, if these wastes meet certain requirements that do not destroy the municipal plant efficiency. (Smith-Texas)
W73-05051

5E. Ultimate Disposal of Wastes

THE USE OF PULP MILL SLUDGES AS EXTENDERS FOR CORRUGATING MEDIUM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 05G.
W73-04564

GLOBAL CONCEPTS OF ENVIRONMENTAL CONTAMINATION,
California Univ., San Diego, La Jolla. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-04609

NEGATIVE AIR PRESSURE CONVEYING,
Western Washington Research and Extension Center, Puyallup.
For primary bibliographic entry see Field 03E.
W73-04612

DISPERSION ESTIMATES OFF NOBSKA POINT USING RECORDING CURRENT METERS,
Ontario Water Resources Commission, Toronto. Water Quality Surveys Branch.
For primary bibliographic entry see Field 05B.
W73-04614

PLAN FOR THE SOUTHERN NORTH SEA,
For primary bibliographic entry see Field 05G.
W73-04618

PROCEEDINGS OF THE NATIONAL GROUND WATER QUALITY SYMPOSIUM.
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W73-04635

SEWAGE DISPOSAL AT POINT BARROW, ALASKA,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-04883

SAMPLING APPARATUS FOR WASTE DISPOSAL SYSTEM,
Texaco Inc., New York. (assignee).
For primary bibliographic entry see Field 05G.
W73-04956

DISPOSAL OF MUNICIPAL WASTE WATER THROUGH FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
For primary bibliographic entry see Field 05D.
W73-04982

INDUSTRIAL AND AGRICULTURAL SOLID WASTES AND PROBLEMS INVOLVED IN THEIR DISPOSAL,
Bureau of Solid Waste Management, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W73-05018

MANAGING THE SOLID WASTE FUNCTION,
Container Corp. of America, Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-05022

SUBDUCTION ZONES: NOT RELEVANT TO PRESENT-DAY PROBLEMS OF WASTE DISPOSAL,
Geological Survey, Menlo Park, Calif.
E. S. Silver.
Nature, Vol 239, p 330-331, October 6, 1972. 2 fig, 17 ref.

Descriptors: *Engineering geology, *Waste disposal, Chemical wastes, Radioactive wastes.
Identifiers: *Subduction zones, *Turbidities, *Deep sea trenches.

Liquefaction of turbidities in subduction zones is not likely to be widespread enough to subduct large volumes of deposited waste, as dumping is bound to be somewhat inaccurate and the boundary of the liquefaction zones is very sharply defined. Even if all wastes reaching the trench were subducted, the rate would be 1 Km per 10,000 year. Thus garbage may pile up against the slope before being subducted. (Anderson-Texas)
W73-05024

LIQUID/SLUDGE INCINERATOR.
For primary bibliographic entry see Field 05D.
W73-05025

PRACTICAL EXPERIENCES OF THERMIC SLUDGE DRYING ON THE CENTRAL TREATMENT PLANT OF NEERSEN,
Niersverband, Viersen (West Germany).
For primary bibliographic entry see Field 05D.
W73-05042

5F. Water Treatment and Quality Alteration

REMOVAL OF SURFACE INACTIVE SUBSTANCES BY FOAM SEPARATION PROCESSES,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 05D.
W73-04557

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS--ANALYSIS AND BIBLIOGRAPHY,
Bureau of Reclamation, Denver, Colo.
D. Toetz, R. Summerfelt, and J. Wilhm.
Bureau of Reclamation Report REC-ERC-72-33, Div Gen Res, Oct 1972. 117p, 19 fig, 337 ref.

Descriptors: *Water quality, *Reservoirs, *Lakes, *Reviews, *Bibliographies, *Environmental effects, Chemical properties, Water quality control, Aeration, Aquatic environment, Mixing, Biological properties.
Identifiers: *Destratification (Thermal), *Reaeration.

The state of the art of research concerning the biological effects of reaeration and destratification is described, with emphasis on lakes and reservoirs. Research needs are discussed, based on this review. Useful descriptions of methods and devices for reaeration and destratification and a comprehensive annotated bibliography are included. (USBR)
W73-04571

INACTIVATION OF SALMONELLA TYPHIMURIUM BY SORBIC ACID,
Wisconsin Univ., Madison. Dept. of Food Science; and Wisconsin Univ., Madison. Food Research Inst.
For primary bibliographic entry see Field 05C.
W73-04851

PERMISSIBLE LEVELS OF TRITIUM IN MAN AND THE ENVIRONMENT,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 05C.
W73-04920

AN EFFECTIVE AND SIMPLE METHOD FOR DISINFECTION OF WATER,
Maharashtra Association for the Cultivation of Science, Poona (India).
S. H. Godbole.
Indian J Med Sci. Vol 25, No 10, p 712-718. 1971.
Identifiers: Fecal contaminants, Copper vessels, Diseases, *Disinfection, *Water pollution treatment, Public health.

The storage of contaminated water in copper vessels for 4-6 hr disinfects it of fecal contaminants. This simple and effective method solves the problem of a clean water supply to the rural population where treatment facilities are not available and not possible in the near future. Storage of drinking water in copper drums in hotels and restaurants would minimize the risk of intestinal diseases to people eating in such places.–Copyright 1972, Biological Abstracts, Inc.
W73-04983

ECONOMICS OF ION-EXCHAGE TECHNIQUES FOR MUNICIPAL WATER--QUALITY IMPROVEMENT,
Bresler and Associates, Inc., New York.
S. A. Bresler, and E. F. Miller.
Journal of the American Water Works Association, Vol 64, No 11, p 764-772, November, 1972. 10 fig, 9 tab, 8 ref.

Descriptors: *Cost analysis, *Operating costs, *Water treatment, Water quality control, Water supply, *Electrodialysis, *Reverse osmosis, *Brackish water, *Municiple water, *Desalination, Operations research.
Identifiers: *Ion-exhange processes.

Preliminary investigations indicate that water-quality improvement systems employing ion-exchange economics are, in certain instances, competitive with the economics of water-quality improvements, systems based on the application of alternative desalting systems, such as electrodialysis and reverse osmosis. Also, in some situations of high-salinity and high-hardness water, a combination of ion exchange and either reverse osmosis or electrodialysis may offer greater economic benefits than single systems; this depends upon local circumstances of feedwater composition, load factor, costs of money, chemicals, electric power, and the feasibility and cost of brine disposal. These processes are described. A cost methodology is discussed in detail; a series of curves are derived which may be used to obtain preliminary estimates of both capital and operting costs. (Bell-Cornell)
W73-05053

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons, Brinckeroff, Quade and Douglas, Inc., Denver, Colo.
F. W. Montanari, and L. M. Brennan.
Journal of the American Water Works Association, Vol 64, No 11, p 761-764, November, 1972. 6 fig, 2 tab.

Descriptors: Northeast U.S., *Desalination, *Electrodialysis, *Computer programs, *Water supply, Water quality, *Operating costs, *Pumping plants, *Estuaries, Water demand, Optimization, Tidal waters, Brackish water, Treatment facilities, Water resources, Planning, Systems analysis, Mathematical models, Equipment.
Identifiers: *Economic analysis, Transportation facilities (Water).

The need for water supply services in the northeastern part of the United States has resulted in the development of most of the suitable reservoir sites close to the demand centers. Additional reservoir development could require extensive aqueduct works if water is to be carried in conduits to points of use. Water supplies, in the traditional sense, are becoming very expensive, and the problem becomes more critical when compounded by a rapidly growing population. An alternative solution to preclude future shortages is the development of new sources--such as desalting. Since some communities may need to draw from brackish sources in order to balance supply with demand--even for brief, infrequent periods--the use of electrodialysis can be considered for improving the dissolved solids makeup of the water. A computer model for predicting the operating costs of an intermittently functioning electrodialysis plant is described. Considered is a combined electrodialysis and pumping-plant unit using a tidal estuary as a water source. The computer program provides a flexible tool for estimating the cost of a potential water supply source on an estuary incorporating direct pumping as well as electrodialysis. (Bell-Cornell)
W73-05054

5G. Water Quality Control

SOIL AND WATER MANAGEMENT FOR SALINITY CONTROL,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-04552

THE USE OF PULP MILL SLUDGES AS EXTENDERS FOR CORRUGATING MEDIUM,
Washington Univ., Seattle. Coll. of Forest Resources.
L. Leney, H. D. Erickson, and B. S. Bryant.
Available from the National Technical Information Service as PB-214 483, $3.00 in paper copy, $0.95 in microfiche. Washington Water Research Center Completion Report, December 1972. 16 p, 3 fig, 2 tab. OWRR A-043-WASH (1), 14-31-0001-3548.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Sludge disposal, Fibers, Industrial wastes, *Waste disposal, Waste treatment.

The research was an attempt to find a better method of disposing of the ever accumulating sludge which comes from the clarifiers when the solids are removed from the effluent waters of a pulp mill. The objective was to determine if sludge could be used as part of the fiber mix used to make corrugating medium. Sludge from three different types of mills was added in quantites of 10, 20, and 40 per cent to commercial corrugating medium furnish (fiber mix). Experimental medium made by improved laboratory methods were tested for flat crush strength. The addition of sludge to the commercial furnish reduced the flat crush strength. The reduction is small enough to be accounted for, at least in part, by the excessive amount of the soft chemical fiber in the experimental furnish. If the useful fiber in sludge is substituted for some of the other sources of chemical fiber which is mixed with the semi-chemical pulp, a corrugating medium with acceptable flat crush strength may be possible. The tests made were insufficient to draw any firm conclusions. From observations of the way flutes failed, it is necessary to determine the internal bond in future tests, as sludge with high inorganic fines content showed more delamination during failure. The amount of fines passing through the sheet-forming screen increased in direct relation to the total fines in the furnish, not to the percent of additional sludge. The use of sludge will increase the fines in the system and result in more fines in the effluent waters.
W73-04564

REPORT ON PROBLEMS OF COMBINED SEWER FACILITIES AND OVERFLOWS 1967.
American Public Works Association, Chicago, Ill. Research Foundation.
For primary bibliographic entry see Field 05D.
W73-04566

METABOLIC ROLE OF SULFATES AND SULFIEDS PRODUCING BACTERIA IN POLLUTION OF WATERS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 05C.
W73-04567

ADSORPTION OF UREA BY SOME SUDANE SOILS,
Gezira Agricultural Research Station, Wad Medani (Sudan).
For primary bibliographic entry see Field 02G.
W73-04590

CONCENTRATION OF PICLORAM IN RUNOFF WATER,
Agricultural Research Service, College Station, Tex.
For primary bibliographic entry see Field 05B.
W73-04591

TOURISTS, FISHING, OIL,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 06B.
W73-04611

SCIENTIFIC AND TECHNICAL ASPECTS OF THE CONTROL OF COASTAL POLLUTION.

Effluent and Water Treatment Journal, Vol 11, No 12, p 669-670, December 1971.

Descriptors: *Coasts, Water pollution sources, Water pollution effects, *Water pollution control, Urban drainage, *Industrial wastes, Rivers, Streams, Outlets, Ships, Drainage, Aesthetics, Public health, Fish toxins, Ecology, Food chains, Productivity, Water purification, *Pollution abatement.

The basic sources of coastal pollution are: direct discharges from urban and industrial areas; rivers and streams with natural outfalls in the sea; ships and small craft anchored in ports and along the coast; and drainage canals. Impurities of a malodorous nature which is aesthetically unpleasant; direct danger of an infectious nature as a hazard to public health; indirect dangers of an infectious nature from pollution of shellfish and other seafood; direct poisonous action on marine fauna; and the lowering of productivity in coastal waters are the resultant damage of coastal pollution. The progressive phases of the fight against marine pollution are prevention, purification, intervention and control. (Ensign-PAI)
W73-04615

PLAN FOR THE SOUTHERN NORTH SEA,
A. J. Shaler.
Effluent and Water Treatment Journal, Vol 11, No 12, p 664-667, December 1971.

Descriptors: *Water pollution control, *Waste disposal, *Ships, *Oil pollution, *Sewage disposal, Rivers, *Outfalls, Industrial wastes, Municipal wastes, Planning, Governments, International commissions.
Identifiers: *North Sea.

The southern part of the North Sea receives the discharges from over 1000 ships of all nations each day which carry most of the commerce to and from Western Europe and the United Kingdom and much of the Middle East's oil. Each tanker loses approximately one pound of cargo per ton as it passes through the treacherous shallows. The sea collects outputs from the estuaries of the Lys; Canal du Nord's polluted contributions from France; the Rhine's filth from Germany; and from Amsterdam, the contaminated discharges from the Ijsselmeer and the westward-flowing canals. The wastes of some fifty million people are added to this. The opportunity for international agreement and basis for cooperation between nations are discussed. The need for a multinational authority is analyzed. (Ensign-PAI)
W73-04618

APPLICATIONS OF SYSTEMS ANALYSIS TECHNIQUES TO WATER RESOURCES,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W73-04623

WATER QUALITY SIMULATION MODEL FOR THE UPPER WABASH RIVER,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W73-04629

WATER RESOURCES IN SOURDOUGH AND HYALITE CREEK WATERSHEDS--A COMPARATIVE STUDY OF QUALITY AND HYDROLOGY,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 04C.
W73-04631

THERMAL POLLUTION REDUCTION BY ADIABATIC DEGASSING,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05D.
W73-04632

STREAM POLLUTION FROM ANIMAL PRODUCTION UNITS,
Louisiana Tech. Univ., Ruston.
For primary bibliographic entry see Field 05B.
W73-04696

A FIVE-MINUTE SOLUTION FOR STREAM ASSIMILATIVE CAPACITY,
Rice Univ., Houston, Tex.
A. W. Busch.
Journal Water Pollution Control Federation, Vol 44, No 7, p 1453-1456, July 1972. 2 fig, 1 tab, 6 ref.

Descriptors: *Organic wastes, *Natural streams, *Reaeration, Oxygen, Waste treatment, Oxygenation, Dissolved oxygen, Mass transfer, Water pollution control, Statistical methods, Mathematical studies, Water quality control, Probability, *Waste assimilative capacity.
Identifiers: *Assimilative capacity, Oxygen transfer, Mass transfer coefficient.

It is shown that the stream assimilative or purification capacity that does not lower the stream's oxygen content below a predetermined value is the significant capacity and should be the maximum capacity made available for intentional waste assimilation. The assimilative capacity is determined by the product of the minimum surface (mass) transfer coefficient, the maximum DO deficit, and the surface area being considered. It is emphasized that there is a difference between predicting reaeration coefficients and establishing assimilative capacity although the literature often implies a relationship. The assimilative capacity is dependent on the instantaneous stream situation and is not related to the average condition. Earlier research on the importance of surface conditions in reaeration is also discussed. These results can be used to project probable minimum transfer coefficients contrasted with the absolute minimum measured in the laboratory under quiescent conditions. It is concluded that the maximum assimilative capacity of a stream that can be depended on to accommodate intentional pollution is equal to the minimum reaeration capacity of the stream. This knowledge can be applied practically by reserving any assimilative capacity exceeding the minimum for any unintentional pollution (e.g., stormwater runoff, agricultural drainage) since only intentional discharge is usually measured. (Mortland-Battelle)
W73-04697

POPULATION RESOURCES, ENVIRONMENT. ISSUES IN HUMAN ECOLOGY,
For primary bibliographic entry see Field 06G.
W73-04734

THE USE OF COMPUTERS IN PHILADELPHIA'S WATER POLLUTION CONTROL ACTIVITIES,
Philadelphia Water Dept., Pa.
C. F. Guarino.
Water Research, Vol 6, Nos 4/5, p 597-600, April/May 1972. 2 tab, 4 ref.

Descriptors: *Computers, *Water pollution control, *Data processing, Automation, Monitoring, Biochemical oxygen demand, Chemical oxygen demand, Instrumentation, Statistical methods, Mathematical studies, Waste water treatment, Water quality, Carbon, Organic wastes, Regression analysis, Indicators, Dissolved oxygen, Turbidity.
Identifiers: Process control, Date interpretation, Organic carbon, Sensors, Turbidimeters.

The use of computers for various purposes in the Philadelphia water department is briefly described. Computers have been used to maintain proper operational records, to monitor condition of mechanical equipment, to furnish information for the design of future plants, and for statistical analysis of data. The use of computers has aided sensor development and possible automation of treatment facilities. In one specific application, the computer is used for multiple regression analysis on data sets containing BOD, total carbon, and COD. This work has indicated that a combination of COD and total carbon is a good predictor of BOD. The computer is also used in field evaluations of various sensors such as dissolved oxygen probes and turbidimeters. (Mortland-Battelle)
W73-04735

AN AUTOMATIC, MULTICHAMBER SOIL--WASHING APPARATUS FOR REMOVING FUNGAL SPORES FROM SOIL,
Calgary Univ. (Alberta). Dept. of Biology.
J. Bissett, and P. Widden.
Canadian Journal of Microbiology, Vol 18, No 9, p 1399-1404, September 1972. 4 fig, 2 tab, 7 ref.

Descriptors: *Laboratory equipment, *Mechanical equipment, *Soil contamination, Soil analysis, Design, Soils, Soil fungi, Water pollution control.
Identifiers: *Spores, *Removal, Sample preparation, Penicillium janthinellum.

An automatic soil-washing apparatus for washing fungus spores out of a large number of soil samples simultaneously consists essentially of ten tubes vertically mounted in a base which allows water and air to circulate through each tube. The tubes are fitted with sieve assemblies to retain the soil samples and tight fitting caps which allow passage of air. The air agitates the soil as the water washes out the spores. The apparatus is also fitted with a siphon which automatically drains the washing columns when the water reaches a certain level. Tests of the apparatus indicated that superficial spores were removed from most of the soil particles. This allowed organisms growing in soil as vegetative mycelia to be isolated more readily without the serious competition commonly encountered from organisms sporulating heavily in the soil. Virtually no cross-contamination of soil samples occurred in the multichambered apparatus. (Little-Battelle)
W73-04820

NEW FINDINGS ON THE USE OF TRICKLE IRRIGATION SYSTEMS IN THE UNITED STATES, AUSTRALIA AND ISRAEL,
For primary bibliographic entry see Field 03F.
W73-04894

PESTICIDES,
Illinois Univ., Urbana. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-04897

CALIFORNIA DRIP-IRRIGATION TESTS MAY PROVE METHOD SIGNIFICANT.
For primary bibliographic entry see Field 03F.
W73-04899

YIELD OF GRAIN LEGUMES AS AFFECTED BY IRRIGATION AND FERTILIZER REGIMES,
For primary bibliographic entry see Field 03F.
W73-04910

ADSORPTION AND TRANSPORT OF AGRICULTURAL CHEMICALS IN WATERSHEDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 05B.
W73-04927

SURFACE WATER QUALITY IS INFLUENCED BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Morris, Minn. Central Soil Conservation Research Center.
For primary bibliographic entry see Field 05B.
W73-04928

ARRANGEMENT IN FLEXIBLE FENCES FOR ENCLOSING IMPURITIES FLOATING ON WATER,
E. G. E. Blomberg.
U. S. Patent No. 3,686,870, 5 p, 35 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 901, No 5, p 1554, August 29, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Abatement, *Pollution abatement, Water pollution control, Water pollution sources, Water quality control.
Identifiers: *Pollution prevention.

The confining boom consists of a skirt which is designed to extend in part above the water and in part below the surface of a body of water. A stress relieving rope is connected at spaced apart intervals. A tether device extends laterally away from the body to the tension device so as to connect the body to the tension device. The boom is linked to two vessels and is used in a V-shaped arrangement. (Sinha-OEIS)
W73-04936

BUOYANT BARRIER AND METHOD FOR INSTALLING THE SAME,
Versatech Corp., Nesconset, N.Y. (assignee).
J. E. Manuel.
U. S. Patent No. 3,686,869, 5 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 901, No 5, p 1554, August 29, 1972.

Descriptors: *Patents, *Barriers, *Oil spills, *Oil pollution, Equipment, Abatement, *Pollution abatement, Water pollution sources, Water pollution control, Water quality control.
Identifiers: *Pollution prevention.

The buoyant barrier comprises a flexible sheet having two parallel side edge portions, and resiliently collapsible air chambers arranged in two series. Each air chamber can be formed of flexible sheet material enclosing a helical compression spring. The air chamber allows inflow and outflow of air according to need. When the barrier is deployed, the inflated air chambers afford buoyant support, and the sheet extends in trough-like fashion to define a water chamber. (Sinha-OEIS)
W73-04937

CENTRIFUGAL SEPARATION APPARATUS FOR SEWAGE,
M. Kohama.
U. S. Patent No. 3,685,721, 4 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1307, August 22, 1972.

Descriptors: *Patents, *Sewage treatment, *Centrifugation, Equipment, Drums, Abatement, *Pollution abatement, Water quality control, Water pollution control, Separation techniques.

A continuous sewage separation apparatus comprises a cylindrical body, arcuate channels formed longitudinally on the body, and guide tubes that extend from the channels to exterior end plates blocking one end. The other ends of the channels are blocked in a water collecting chamber to form a rotary drum. Sewage is introduced into the drum and water leaves by means of a drain hole in it. (Sinha-OEIS)
W73-04941

METHOD FOR THE SEPARATION OF OIL AND WATER FROM AN EMULSION,
Texaco, Inc., New York. (assignee).
M. H. Van Stavern, H. D. Moorer, G. H. Miller, and K. M. Gunn.
U. S. Patent No. 3,685,653, 4 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1292, August 22, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Abatement, *Pollution abatement, Equipment, Water pollution control, Water quality control, *Separation techniques.

The emulsion is picked up on the surface of a rotating roll. The emulsion is then brought into contact with a supplemental or so-called transfer roll located above and out of contact with the body of emulsion. The transfer roll is spaced closely from the pick up roll a critical distance in the range of 1 to 6 mills effective to cause the minute particles of dispersed oil to coalesce and segregate. The emulsion is broken and the oil is liberated. (Sinha-OEIS)
W73-04943

APPARATUS FOR CONFINING FLOATING MATERIALS,
Uniroyal, Inc., New York. (assignee).
W. Juodis, and G. J. Gauch.
U. S. Patent No. 3,685,297, 10 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1213, August 22, 1972.

Descriptors: *Patents, *Flotsam, *Jetsam, Equipment, Barriers, *Oil spills, *Oil pollution, Abatement, *Pollution abatement, Water pollution sources, Water pollution control, Water quality control.

Adjacent modular floats are longitudinally aligned in end-to-end relation. Adjacent floats are coupled together at the connecting portion in such manner as to restrain the movable portions of the end walls from moving apart further than a specified distance. (Sinha-OEIS)
W73-04944

ELASTOMERIC OIL SLICK BOOM,
T. O. Bogosian.
U. S. Patent No. 3,685,296, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1213, August 22, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Barriers, Equipment, Abatement, *Pollution abatement, Water pollution sources, Water pollution control, Water quality control.
Identifiers: *Booms.

The boom comprises a rigid sheet of asbetos rubber of about 10 to 20% styrene-butadiene rubber content by weight. A closed cell sponge is attached to both faces of the sheet. A portion of the sheet is held below water level. The sheet has attached to each end of the boom a flexible compressed rubber sheet having a 60 to 70% content of styrene-butadiene rubber. Each of the laminated sheets is about one-eighth inch thick. The boom is anchored to hold it in a fixed position to retain the oil as a barrier. (Sinha-OEIS)
W73-04945

BARGE BASED SKIMMING SYSTEM FOR OIL SLICKS,
R. R. Ayers.
U. S. Patent No. 3,684,095, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 3, p 940, August 15, 1972.

Descriptors: *Patents, *Oil spills, Skimming, *Oil pollution, Equipment, Abatement, *Pollution abatement, Water quality control, Water pollution control, Water pollution sources.

A barge mounted wave reflector and boom arrangement diverts oil and water into open bottom chutes positioned on either side of a barge. Wave action is damped at the upstream end of the chutes and a skimming operation is performed downstream of it to divert floating oil upward onto a shelf-like structure while allowing the underlying water to continue its passage through the open bottom chute. The oil is moved to a relatively quiet area and stored for subsequent reclamation. (Sinha-OEIS)
W73-04949

APPARATUS FOR THE COLLECTION OF BUOYANT FOREIGN MATTER,
F. A. O. Waren.
U. S. Patent No. 3,682,316, 4 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 901, No 2, p 543, August 8, 1972.

Descriptors: *Patents, *Flotsam, Jetsam, Seaweed, *Oil spills, *Oil pollution, Equipment, Water pollution sources, Water pollution control, *Pollution abatement, Abatement.

The apparatus comprises a floating tank with an inlet tract to draw in water from a level at or near the surface of the water. The inlet tract may include a filter arrangement which enables oil to be pumped into the tank while preventing flotsam and jetsam such as seaweed from being pumped into it. Within the tank, the oil will rise and be trapped while the water will be returned to the body of water from which it was drawn. The tank may be provided with a pair of contra-rotating endless belts. Seaweed or other flotsam may be caught by the fingers and raised by the belt system to the deck level of the tank where it may be collected. (Sinha-OEIS)
W73-04950

SAMPLING APPARATUS FOR WASTE DISPOSAL SYSTEM,
Texaco Inc., New York. (assignee).
F. H. Binkley, Jr., E. S. Lanier, Jr., and R. G. Barrilleaux.
U. S. Patent No 3,680,389, 4 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 74, August 1, 1972.

Descriptors: *Patents, Equipment, *Oil pollution, Water pollution control, *Sampling, Waste water, *Water quality control, Sea water, *Offshore platforms, Pollution abatement, Abatement, *Water pollution control.

A liquid sampling device to be used at a marine structure is described. The liquid sampler is carried within a longitudinal, moveable guide. It is used to monitor the quality of the water being discharged at the offshore location. The sampler can be lowered to a desired water depth. It has a spring actuated container which is lowered in a closed condition but is opened at the predetermined depth. (Sinha-OEIS)
W73-04956

FENCE FOR ENCLOSING IMPURITIES FLOATING ON WATER,
B. Midby.
U. S. Patent No 3,613,376, 2 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 891, No 3, p 958, October 19, 1971.

Descriptors: *Patents, *Flotsam, *Pollution abatement, Equipment, Water pollution treatment, Water pollution, Water quality control.

The fence consists of an elongated piece of cloth or plastic foil with pockets having openings facing one of the longitudinal edges of the cloth or foil. Each pocket has a float element that extends over the main part of the height of the fence and tapers downward. The fence is held in a floating position with the side surfaces held in a vertical position. (Sinha-OEIS)
W73-04957

APPARATUS FOR GATHERING AND CLEANING WATER SURFACES OF POLLUTION,
P. S. Gadd.
U. S. Patent No 3,584,462, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 887, No 3, p 767, June 15, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Abatement, Equipment, Water quality control, Water pollution control, *Flotsam.

Stabilized floating cradles are provided within which a floating curtain or barrier is supported for limited movement. Damage to the barrier is prevented by protective screens carried by the cradles. Upstanding baffles are carried by either or both of the curtain or cradle structures. This elongate floating boom is to be used for surrounding and confining floating material such as oil, or floating debris. (Sinha-OEIS)
W73-04958

THEORY OF CHEMICAL TRANSPORT WITH SIMULTANEOUS SORPTION IN A WATER SATURATED POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry; and Oregon State Univ., Corvallis. Dept. of Soils.
For primary bibliographic entry see Field 02F.
W73-04963

CONSERVATION OF SANDY SOILS WITH A SURFACE MULCH,
Agricultural Research Service, Big Spring, Tex.
For primary bibliographic entry see Field 04D.
W73-04974

ENVIRONMENT POLLUTION BY PESTICIDES AND AGRICULTURE IN JAPAN (IN JAPANESE),
S. Yasuda.
Sci Rep Fac Agric Kobe Univ. Vol 9, No 1/2, p 49-58. 1971. Illus.
Identifiers: Agricultural chemicals, Fertilizers, *Japan, *Pesticides, Water pollution sources, Air pollution, Soil contamination, Water pollution.

A statistical study on air, water and soil pollution by agricultural pesticides is presented. Coefficient of pesticides and fertilizers used and causes and results of their use are discussed.–Copyright 1972, Biological Abstracts, Inc.
W73-04976

AN EFFECTIVE AND SIMPLE METHOD FOR DISINFECTION OF WATER,
Maharashtra Association for the Cultivation of Science, Poona (India).
For primary bibliographic entry see Field 05F.
W73-04983

ISSUES IN ENVIRONMENTAL QUALITY,
Iowa State Univ., Ames.
C. P. Gratto.
Journal of Soil and Water Conservation, Vol 26, No 2, p 45-46, March-April 1971.

Descriptors: *Pollution abatement, Pollutants, *Environmental effects, Water pollution control, Water quality control.
Identifiers: *Environmental quality.

Recent interest in environmental quality has produced a large number of related and relative terms to describe the situation. An attempt is made to tie these terms together. Also, a number of environmental issues are presented. An analogy between our environment and a simplified system is presented in an effort to develop the points in a more simple manner. (Skogerboe-Colorado State)
W73-04995

AQUATIC AND WETLAND PLANTS OF SOUTHWESTERN UNITED STATES,
Southern Methodist Univ., Dallas, Tex.
For primary bibliographic entry see Field 02I.
W73-04999

A PRIMER ON AGRICULTURAL POLLUTION, SUMMARY,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 05B.
W73-05002

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT,
Iowa Agriculture and Home Economics Experiment Station, Ames.
J. R. Miner, and J. R. Jordon.
Available from Midwest Plans Service, Ames, Iowa 50010, for $2.00 per copy. Midwest Plan Service, Iowa State University, Ames, Report MWPS-17, June 1971. 71 p, 2 ref. EPA Project 13040 FUU.

Descriptors: *Bibliographies, *Livestock, *Waste disposal, *Waste treatment, *Wastes, *Farm wastes, Water quality control, Water pollution sources.

This bibliography of livestock waste management reports and papers was compiled in order to alleviate difficulty in locating and retrieving pertinent information. The bibliography is cross referenced by an author index and a keywork index. Over 1500 titles were searched for keywords relating to livestock wastes, resulting in retrieval of approximately 510 references for this bibliography. (Smith-Texas)
W73-05011

FARM ANIMAL WASTE MANAGEMENT.
North Central Regional Technical Committee NC-69, Report, 1970. 141 p, 2 fig, 34 tab, 75 ref.

Descriptors: *Livestock, *Farm wastes, *Waste management, *Lagoons, *Waste disposal, *Fertilizers, Feed lots, Industrial wastes, Organic wastes, Urine, Water pollution, Aerobic treatment, Anaerobic treatment, Cost comparisons, Economics, Biological properties, Chemical properties, Physical properties, *Reviews.

In order to treat farm animal waste effectively and economically, certain characteristics, such as biological properties, and physical and chemical properties, should be studied. Treatment of animal wastes falls into three categories: (1) aerobic treatment, which includes oxidation ditches and aerobic lagoons; (2) anaerobic treatment, which includes anaerobic digestion and anaerobic lagoons; and (3) combined anaerobic-aerobic systems. In addition to treatment, direct disposal of animal wastes onto the land has been a traditional management practice of the animal industries. This aspect of farm animal waste management is covered thoroughly since most farmers in the North Central Region of the United States continue to find it economical to practice land disposal of animal wastes. (Smith-Texas)
W73-05013

LARGE PUMPING STATIONS,
Baubehorde (West Germany). Hauptabteilung Stadtenwasserung.
For primary bibliographic entry see Field 08C.
W73-05015

DISSOLVED OXYGEN RESOURCES AND WASTE ASSIMILATIVE CAPACITY OF THE LA GRANGE POOL, ILLINOIS RIVER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-05020

MANAGING THE SOLID WASTE FUNCTION,
Container Corp. of America, Chicago, Ill.
L. E. Williams.
American Paper Industry, Vol 53, No 2, p 40-45, February 1971.

Descriptors: *Solid wastes, *Recycling, *Waste disposal, Wastes, Capital costs, Cost-benefit ratio, Economic justification, Marketing, Economics.
Identifiers: *Packaging waste, *Waste management.

Development of both solid waste recovery facilities and a willing market for such products are becoming crucial to a nation that generates some 3 1/2 billion tons of refuse per year. Efficient waste control is becoming a function of the growing solid waste recovery industry. However, this efficiency is hindered by lack of public awareness and cooperation, capital investment, and marketing logistics. Recycling is feasible only to the extent that there exists a dependable market. This area is a problem for research and public relations. Lloyd Williams offers the successful efforts of Container Corporation of America in the field of packaging waste as a model for expansion within this particular sector and for however it may apply in all areas of solid waste recovery. (Anderson-Texas)
W73-05022

REGIONAL COOPERATION SOLVES POLLUTION PROBLEMS.

Public Works, Vol 103, No 10, p 70, October 1972, 2 fig.

Descriptors: *Waste water treatment, *Regional development, *Regional economics, Personnel, Treatment facilities, *Pennsylvania.
Identifiers: *Lackawanna River Basin Sewer Authority.

The cooperation of 15 communities in northeastern Pennsylvania has resulted in four independently operating, but similar waste treatment plants. This also includes the construction of 22 miles of new interceptor lines. Later the system could be extended to serve more demands. The regional agency operates the system, which consists of an executive director and a staff of 24 new members to maintain 22 miles of interceptor lines. The ability to shift plant personnel from one place to another, using the same warehouse facilities etc. are the advantages of such a regional agency. Presently the four plants serve 65,000 persons and will serve 95,000 by the year 2010. (Morparia-Texas)
W73-05036

COMPUTER USE ON AN ENVIRONMENTAL ENGINEERING PROJECT,
Camp, Dresser and McKee, Boston, Mass., Dept. of Systems Development.
R. C. Feldman.
Civil Engineering, ASCE, Environmental Design and Engineered Construction, Vol 43, No 1, p 60-63, January, 1973. 3 fig.

Descriptors: *Water pollution control, *Computers, *Massachusetts, Estimating, Cost analysis, Projects, Management, Digital computers, Pipes, Water treatment, Design, Rivers, Flood data, Sewers, Costs, Systems analysis, Treatment facilities.
Identifiers: *Merrimack River, *Pumping stations, Contract specifications, North Andover.

Computers are an integral part of today's environmental engineering projects. They provide meaningful and timely management information, abolish routine computation work, and generate alternative solutions. Described is the use of a computer to help design a water pollution abatement scheme for a section of the Merrimack River in Massachusetts. The technical and administrative applications used in the project are discussed. They include: Estimating the cost of laying pipe in the ground; finding the best design for a pumping station; analyzing changes in flood conditions due to laying intercepting sewers along the river banks; as well as preparing contract specifications. It is concluded that computers provide an expanded information base, and that given time to consider it, the engineer becomes the decision maker. Usually, computer use means one can do a better job for the same money. (Bell-Cornell)
W73-05056

RESULTS OF PHYTOPHYLACOLOGICAL INVESTIGATIONS RELATED TO THE INJURY OF CORIANDER (CORIANDRUM SATIVUM L.), (IN HUNGARIAN),
N. Ferenc.
Herba Hung, Vol 10, No 1, p 37-46, 1971, Illus, English summary.
Identifiers: *Coriander-D, Coriandrum-Sativum-D, Injury, Lygus-Rugulipensis, Phylacological, *Pseudomonas, Vector, Weather.

The damage was caused by Pseudomonas. The weather prevailing in the period between the shooting and flowering of coriander was decisive as regards the appearance of the infection; abundant rainfall and temperatures between 15 and 20 deg C appeared to be optimum for the infection to take place. The infection was spread by insects, mainly Lygus rugulipensis. Control was achieved with pesticide sprays at the appropriate plant developmental stage and suitable weather conditions.--Copyright 1972, Biological Abstracts, Inc.
W73-05081

APPRAISAL OF WATER RESOURCES IN THE EAST CENTRAL FLORIDA REGION,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 04B.
W73-05091

HYDROLOGY AND RECREATION ON THE COLD-WATER RIVERS OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Lansing, Mich.
G. E. Hendrickson, and C. J. Doonan.
Geological Survey Water Information Series Report 3, 1972. 83 p, 70 fig, 5 tab, 62 ref.

Descriptors: *Hydrology, *Rivers, *Recreation facilities, *Cold-water fish, *Michigan, Water

quality, Streamflow, Watershed management, Erosion, Sediment transport, Water temperature, Water quality control, Water pollution control, Channel morphology.

Michigan's cold-water rivers provide recreation to thousands of trout fishermen, boaters, campers, and cabin-dwellers. The recreational values of these rivers are dependent on their streamflow characteristics, water-quality, and character of channel, bed, and banks. Recreational values are generally benefited by a relatively uniform streamflow and a high sustained flow even during drought periods. Other valued qualities are clear water free from objectionable contaminants and river banks that are protected from erosion. A correlation of hydrologic parameters and trout populations showed a general negative relationship between mean annual maximum water temperatures and trout populations. There was positive relationship between the ratio of the 90% and 10% duration discharges and trout populations. Other hydrologic parameters investigated suggested correlation to various degrees. Maintenance of high flow during drought periods may involve management of groundwater pumpage, placing limitations on surface-water diversions, and management of the river basin to maintain or improve groundwater recharge. Maintenance or lowering of maximum water temperatures can be accomplished by preserving streamside vegetation, maintaining high drought flows, and controlling disposal of heated water to streams. (Woodard-USGS)
W73-05094

HYDROLOGY OF CHANNEL-FILL DEPOSITS NEAR SALISBURY, MARYLAND AS DETERMINED BY A 30-DAY PUMPING TEST,
Maryland Geological Survey, Annapolis.
For primary bibliographic entry see Field 04B.
W73-05109

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

ANALYZING ORGANIZATIONAL CONFLICTS IN WATER RESOURCE MANAGEMENT: A SYSTEMATIC APPROACH,
Analytic Sciences Corp., Reading, Mass.
For primary bibliographic entry see Field 06E.
W73-04551

APPLICATIONS OF SYSTEMS ANALYSIS TECHNIQUES TO WATER RESOURCES,
Environmental Dynamics, Inc., Los Angeles, Calif.
J. A. Dracup, V. S. Budhraja, and S. G. Grant.
Available from the National Technical Information Service as PB-214 518, $6.75 in paper copy, $0.95 in microfiche. Report, June 1972. 265 p, 472 ref. OWRR X-116 (1). 14-31-0001-3425.

Descriptors: *Systems analysis, *Hydrology, *Planning, *Water supply, *Ground water, *Desalination, *Water quality, Hydrographs, Hydrologic systems, Management, Operations research, Economics, Political aspects, Social aspects, Water resources development, Watershed management, Ground water resources, Desalination processes, Saline water systems, *Reviews.

The current state of the art in water resource systems analysis was critically assessed. The study focuses on the actual application and implementation of systems analysis techniques to water resources. That is, examples of where systems analysis has been actually utilized in the planning, design and/or operation of a particular water resource system are analyzed. This study will enable practicing engineers, planning agencies and research investigators to use and expand the utilization of the techniques of system analysis in their activities. This study includes assessment of recent publications in the areas of hydrologic, surface water, ground water, desalination and water quality systems. Topics discussed also include urban water resources systems analysis; ecology and life sciences as it applies to water resources systems analysis; the integration of economic, political, legal, social and institutional factors into water resource systems analysis; and other pertinent topics. This study also emphasizes the priorities of research and the areas of missing research in water resources systems analysis. The text contains a comprehensive review of the subject, and incorporates material from earlier report 'An Assessment of Optimization Techniques as Applied to Water Resource Systems'. (See also W73-02878)
W73-04623

OPERATING POLICIES FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04628

A METHODOLOGY FOR ESTIMATING RESERVOIR OPERATION EFFICIENCY BENEFITS FROM SNOWMELT FORECASTING IMPROVEMENTS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 04A.
W73-04803

ONE APPROACH TO IRRIGATION MODELING UNDER RISK,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 03F.
W73-05052

ECONOMICS OF ION-EXCHAGE TECHNIQUES FOR MUNICIPAL WATER--QUALITY IMPROVEMENT,
Bresler and Associates, Inc., New York.
For primary bibliographic entry see Field 05F.
W73-05053

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons, Brinckeroff, Quade and Douglas, Inc., Denver, Colo.
For primary bibliographic entry see Field 05F.
W73-05054

COMPUTER USE ON AN ENVIRONMENTAL ENGINEERING PROJECT,
Camp, Dresser and McKee, Boston, Mass., Dept. of Systems Development.
For primary bibliographic entry see Field 05G.
W73-05056

PLANNING THE UTILIZATION OF A LARGE RESERVOIR IN A POWER SYSTEM,
British Columbia Hydro and Power Authority, Vancouver. Planning Dept.
For primary bibliographic entry see Field 04A.
W73-05057

SELECTION OF MATERIALS, AN IMPROVED MODEL OF CHOICE,
P. H. Engelman.
Civil Engineering and Public Works Review, Vol 67, No 792, p 735-738, July, 1972. 3 tab, 1 append.

Descriptors: *Decision making, Organizations, *Computer programs, *Simulation analysis, Goods, Prices, Water resources development, Pipes, Economics, Optimization, Mathematical models, Systems analysis.
Identifiers: *Materials selection, *Utility aspects, *Choice models, Uncertainty.

Conventional techniques of rational choice making fall short in that they do not produce results which represent a rational decision function of the organization involved, but rather the value judgment of the choice maker. Presented is an organizational solution to this problem. A model for material selection is developed and reviewed. Using computer techniques, the model simulates the utility aspect of selected criteria and permits the determination of what weight key executives place on particular choice attributes, including uncertainty (risk taking). This enables development of a preference curve for a particular firm or situation, which then forms the basis of a 'rational' decision ('rational' within the definition of formal, logical, internally and externally consistent handling of all the attributes of choice). Considered is the selection between two pipe materials, each having the same attributes of flow characteristic and installation cost, but differentiating in price per unit and quality. The model provides a method of comparison and selection between different classes of goods, and handles the logical situation when three or more materials are subject to selection. It can be used by both private firms and public utilities and results in improving (perhaps optimizing) decisions on choice of the 'best' materials. (Bell-Cornell)
W73-05058

6B. Evaluation Process

THE IMPACT OF A MAJOR NEW RESERVOIR UPON RECREATION BEHAVIOR,
Oklahoma Water Resources Research Inst., Stillwater.
R. D. Hecock, and J. F. Rooney, Jr.
Available from the National Technical Information Service as PB-214 480, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute Completion Report, December 1972. 42 p, 13 fig, 11 tab, 31 ref. OWRR B-022-OKLA (1).

Descriptors: *Recreation, *Multiple purpose reservoirs, *Project benefits, Recreation demand, Social behavior, Social impact, Water policy, Planning, Social participation.
Identifiers: *Keystone Reservoir, Arkansas River, Tulsa (Oklahoma), Mannford (Oklahoma).

The project was undertaken in order to assess the nature of and extent of impact on recreation behavior that has derived from the development of a new reservoir. Research findings suggest that the impact on the general recreation behavior of population in the study area as a whole was relatively modest - about 25% of respondents suggesting that their recreation behavior had changed as a result of Keystone Reservoir's development. The effect of distance is strong however, and while almost all the residents within ten miles had been affected, almost none of the respondents beyond sixty miles were affected by the new reservoir development. The decline of impact with distance is even steeper where competing reservoirs are involved. The conclusions are related to policy formulation as well as management and planning practices.
W73-04561

PRELIMINARY INVESTIGATION OF A GROUNDWATER MANAGEMENT PROGRAM FOR THE BIG SIOUX RIVER,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 04B.
W73-04563

MULTIOBJECTIVE PLANNING FOR ENVIRONMENTAL QUALITY,
Bureau of Reclamation, Denver, Colo.
G. H. Wallen.
Paper, American Society Civil Engineers Irrigation and Drainage Special Conference, Spokane, Washington, Sept. 1972. 12 p, 1 tab, 6 ref.

Descriptors: *Environmental effects, Planning, Environment, Water quality, Sound, Ecology, Land management, Land resources, Natural resources, Water resources development, Decision making, Evaluation, Project planning, Balance of nature, Wildlife conservation, Conservation, Environmental engineering.
Identifiers: *Environmental quality, *Environmental evaluation, Air quality.

Increased emphasis has been placed on developing plans to enhance the quality of the environment. Based on the National Environmental Policy Act of 1969 and the Proposed Principles and Standards for Planning Water and Related Land Resources prepared by the Water Resources Council, enhancement of environmental quality would include the management, conservation, preservation, creation, restoration, or improvement of the quality of natural and cultural resources and ecological systems. Specific planning efforts would be directed toward conservation and development of open space; flowing streams; lakes; beaches and shores; wilderness, primitive and natural areas; estuarine and wetland areas; other areas of natural beauty; archeological, historical, cultural, biological, and geological resources; ecological systems; and water, air, land, sound, and visual quality. Evaluation of the beneficial and adverse effects of proposed projects and programs can be based on factors that describe the quantity of the resources affected, their quality, and suitability to provide for human use.
W73-04575

TOURISTS, FISHING, OIL,
Humble Oil and Refining Co., Houston, Tex.
J. R. Jackson, Jr.
Work Boat, p 13, 26, May, 1972.

Descriptors: *Coasts, *Natural resources, *Resource development, *Exploitation, *Fishing, *Oil industry, Tourism, Water pollution, Oil spills, United States.
Identifiers: *Compatible use.

The possibility of a profitable and harmonious combination of tourism, fishing and oil production in coastal states is discussed within the framework of 'compatible use.' This means that if one use of a natural resource is paramount, other uses may still be permitted as long as they do not greatly interfere with the dominant use. The primary focus in this case is on fishing and oil production. It is suggested that oil production should be allowed in offshore areas, although fishing is the paramount use of these areas. Oil spills are viewed in a broad framework and damage to fishing is described as only temporary. A greater spirit of cooperation between the fishing and oil industries is urged. (Ensign-PAI)
W73-04611

APPLICATIONS OF SYSTEMS ANALYSIS TECHNIQUES TO WATER RESOURCES,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W73-04623

EVALUATION OF PLANNING FOR WETLANDS DRAINAGE PROJECTS IN THE SOUTHEASTERN COASTAL PLAINS,
Research Triangle Regional Planning Commission, Research Triangle Park, N.C.
M. E. Rulison, and C. B. Martin.
Available from the National Technical Information Service as PB-214 587, $3.00 in paper copy, $0.95 in microfiche. Final Report, FR-26U-593, 1972. 128 p, 16 exhib, 65 ref, 4 append. OWRR C-2080 (No. 3361) (1).

Descriptors: *Project planning, *Small watersheds, *Evaluation, *Cost-benefit analysis, Cost-benefit ratio, Cost sharing, Benefits, Costs, Channel improvement, Wildlife, Southeast U.S., *Coastal plains.

The planning process used to design flood control and drainage projects containing hardwood bottomland wetlands was investigated in this study of 12 such small watershed projects located in the coastal plain of the Southeast U.S. Three topics were addressed: examination of benefit-cost procedures employed, potential effects of altered project objectives, and, briefly, post construction review of project effects relative to what had been planned. It was concluded that if economic development is accepted as a project objective, it should dominate the planning process; alternative plans for achieving economic development by water resources or other means should be considered. At present, economic development is merely the measure by which a specific water resources project is justified. It was also concluded that the project objectives other than national economic development have not received equal and adequate attention in the planning process. Procedures used by the Corps of Engineers and the Soil Conservation Service were found to be not comparable with respect to formation of benefit-cost ratios, reporting of cost shares, and other matters.
W73-04624

PLANNING THE UTILIZATION OF A LARGE RESERVOIR IN A POWER SYSTEM,
British Columbia Hydro and Power Authority, Vancouver. Planning Dept.
For primary bibliographic entry see Field 04A.
W73-05057

HYDROLOGY AND RECREATION ON THE COLD-WATER RIVERS OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 05G.
W73-05094

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC ANALYSIS OF IRRIGATION SYSTEMS APPLICABLE TO THE NORTHERN PLAINS,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 03F.
W73-04634

A STUDY OF THE COST OF WASTEWATER TREATMENT TO WET-PROCESS TEXTILE MANUFACTURING PLANTS IN SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 05D.
W73-05012

INFLUENCE OF THE PRESETTLING TANK SIZE ON DIMENSIONING AND COST OF A SEWAGE TREATMENT WITH ACTIVATED SLUDGE,
Technical Univ., Lodz (Poland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-05033

ALUMINUM FLUORIDE FROM WET PROCESS PHOSPHORIC ACID WASTES.
For primary bibliographic entry see Field 05D.
W73-05035

PH NEUTRALIZATION PROCESS CONSIDERATIONS,
Foxboro Co., Mass.
For primary bibliographic entry see Field 05D.
W73-05047

SYSTEM STUDY, VACUUM SEWAGE COLLECTION.
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 05D.
W73-05050

THE ECONOMIC FEASIBILITY OF TREATING TEXTILE WASTES IN MUNICIPAL SYSTEMS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05D.
W73-05051

COMPUTERIZED PROCEDURE FOR ESTIMATING COSTS OF DESALTING SYSTEMS,
Banner (J. T.) and Associates, Inc., Brookings, S. Dak.
For primary bibliographic entry see Field 03A.
W73-05055

6D. Water Demand

THE IMPACT OF PUBLIC WATER UTILITY PRICING POLICY ON INDUSTRIAL DEMAND AND REUSE,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. Ridge.
Available from the National Technical Information Service as PB-214 393, $4.50 in paper copy, $0.95 in microfiche. Report Technical Information Series No 72 SD 257, 1972. 70 p, 8 tab, 89 ref, 4 append. OWRR C-3169 (no 3697) (1), 14-31-0001-3697.

Descriptors: Evaluation, *Elasticity of demand, *Water rates, *Cost analysis, Pricing, *Water reuse, *Water demand, *Industrial water, Regression analysis, Pulp and paper industry, Food processing industry, Utilities.

An analysis of five industries that are major users of public utilities was conducted to determine whether their demands for public water are affected by changes in water rates. Industries covered were: fluid milk processing, poultry dressing, malt brewing, papermills, and paperboard mills. Plants in each industry were surveyed on water demand and use practices and 90 survey responses were received. Among plants that depended primarily on public water utilities for their total water intake, 34% reported having recently limited intake due to an increase in water intake cost. Cross-sectional regression analysis of the survey data for each industry was undertaken to develop price elasticity estimates for water intake demand. Statistically significant elasticity coefficients were found for breweries and milk processers, with average price elasticites of -.3 and -.6 respectively. Cost estimates for the typical water reuse measures in each industry were made and found to be well within the reported range of public utility water rates. The general conclusion of the study is that industries dependent on public water utilites and having conservation and reuse alternatives will respond to water rate increase by reducing demand.
W73-04553

THE IMPACT OF A MAJOR NEW RESERVOIR UPON RECREATION BEHAVIOR,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W73-04561

APPRAISAL OF WATER RESOURCES IN THE EAST CENTRAL FLORIDA REGION,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 04B.
W73-05091

METHODS FOR EVALUATING WATER NEEDS IN AGRICULTURE: PART I. TERMS OF THE HYDRAULIC EVALUATION DEPENDING ON THE PLANT LIFE AND CLIMATE,
Institut National de la Recherche Agronomique, Toulouse (France). Station d'Agronomie.
For primary bibliographic entry see Field 03F.
W73-05172

6E. Water Law and Institutions

ANALYZING ORGANIZATIONAL CONFLICTS IN WATER RESOURCE MANAGEMENT: A SYSTEMATIC APPROACH,
Analytic Sciences Corp., Reading, Mass.
R. J. Martel, and D. McLaughlin.
Available from the National Technical Information Service as PB-214 540, $3.00 in paper copy, $0.95 in microfiche. Report TR-200, September 1, 1972, 125 p, 28 fig, 7 tab, 31 ref, 4 append. OWRR C-2104 (no 3397) (1).

Descriptors: *Political aspects, *Institutional constraints, *Water transfer, *Flood plain zoning, *Urbanization, *Community development, *Massachusetts, Economic impact, Tax rate, Local government, Administrative decisions, Computer models, Rural sociology, *Connecticut River.
Identifiers: *Wetland conservation, *Public participation, Political simulation, Conflict resolution.

A systematic approach to analyzing conflicts between planning agencies and citzen groups over water and related land-use alternatives is presented. The methodology consists of building dynamic system models of the institutional and economic factors involved in a conflict, and using the models to make quantitative and qualitative predictions of the course of events. Organizational goals, constraints, strategies and interactions are represented by dynamic feedback models, which are based on information and data provided by participant-observers who are actively involved in the conflict. The methodology was applied to two case studies in Massachusetts; the proposed diversion of the Connecticut River at Northfield Mountain, and wetlands protection in the Neponset River watershed (Traphole Brook). A computer simulation model of land-use economics in a typical Massachusetts suburban community is described, and the theoretical basis for this approach to applied social science research is discussed. The methodology should be of interest to policy researchers and planners concerned with public participation in water resources planning.
W73-04551

AMERICAN MYTH: DESERT TO EDEN: THEORIES OF INCREASED RAINFALL AND THE TIMBER CULTURE ACT OF 1873,
Montana Univ., Missoula. Dept. of History.
For primary bibliographic entry see Field 04A.
W73-04599

IOWA PASSES EROSION-CONTROL LAW,
Soil Conservation Service, Des Moines, Iowa.
W. T. Moon.
Soil Conservation, Vol 36, No 12, p 272-273, 1971.

Descriptors: Soil erosion, Land management, *Erosion control, Soil management, *Legislation, *Iowa, *Soil conservation.

A new law - described as the most far-reaching soil conservation law in the country - went into effect in Iowa on July 1. The law is called a conservancy district law. It sets up six conservancy districts, which take in the entire state, on a watershed basis to coordinate efforts of drainage districts and soil conservation districts and to help put into effect the comprehensive statewide water-resources plan. It requires that landowners, urban and rural, whose soil loss exceeds certain limits employ erosion-control measures. Landowners are to be given time to reduce erosion to an acceptable level. The objective of the law is to stop erosion by any means. (Skogerboe-Colorado)
W73-04905

CAN ENGINEERING FORECASTERS EFFECT WATER LAW.
Oklahoma Univ., Norman. Bureau of Water Resources Research.

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA4, Proc. Paper 8329, p 479-484, 1971. 1 tab.

Descriptors: *Forecasting, *Legislation, *Water law, Sanitary engineering, Water rights, Ecology, Riparian rights, Appropriation, Gross National Product.
Identifiers: Res Communes.

Emerging water resources problems associated with the escalation of the nation's life style and population growth made possible by unprecendented technological capability are described. The importance of shear magnitude and short response time as well as an evident shift of emphasis from an open loop to a closed loop system was also stressed. Engineering has accepted the necessity of advance planning and exploration of alternates using the systems approach looking at possible and probable worlds. Comprehensive systems with roots firmly grounded in the future are required to meet the needs before they present themselves, freeing the engineer from historic and rigid laws. The Riparian and appropriation doctrines are all found wanting, and based on a Res Communes doctrine legislative law is suggested that will provide for operation and management of water resources systems in an optimal fashion, permitting engineers, economists, and lawyers to work together placing technological and ecological priorities in their proper perspective. Such a system would protect long-term investment, enable long-range planning and establish alternative goals. (Skogerboe-Colorado)
W73-04923

DETERGENTS AND THE NATION'S WATER,
League of Conservation Voters, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-05021

6G. Ecologic Impact of Water Development

ENVIRONMENTAL EFFECTS OF OIL POLLUTION IN CANADA, AN EVALUATION OF PROBLEMS AND RESEARCH NEEDS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-04620

POPULATION RESOURCES, ENVIRONMENT. ISSUES IN HUMAN ECOLOGY,
P. R. Ehrlich, and A. H. Ehrlich.
W. H. Freeman Co.: San Francisco, Calif., 1972. 2nd Edition. 509 p, Illus, Maps, Pr $9.50.

Identifiers: Crowding, *Ecology, Environment, *Human population, Resources, Issues.

In this revised edition, statistics have been updated throughout and substantial additions and revisions have been made in most sections. Entirely new sections have been added on many topics, including forest resources, net reproductive rates and zero population growth, the impact of population growth upon the environment, heavy metals pollution, ecocide in Indochina and Thomas Malthus. Material has been expanded dealing with energy, weather, pesticides, integrated control, the Green Revolution, novel foods, radiation hazards, air pollution, crowding, birth control, population policies, abortion and other major topics. The following recommendations are included as possible answers to the present pollution problems: control population through the application of political pressure by the USA government; enact a massive campaign to restore a quality environment in North America; focus attention on other developed countries and persuade them to direct their attentions to the problems of overpopulation and environmental degradation; institute, through public support, a new political outlook which recognizes the urgency of the problems mentioned and adheres to a determined effort to do something about them; realize the way man must live on this Earth if he is to survive as a species.--Copyright 1972, Biological Abstracts, Inc.
W73-04734

ISSUES IN ENVIRONMENTAL QUALITY,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 05G.
W73-04995

SALMON AND TROUT: A RESOURCE, ITS ECOLOGY, CONSERVATION AND MANAGEMENT,
D. Mills.
St. Martin's Press: New York, N.Y., 1971. 351 p, Illus, Maps. Pr. $14.95.
Identifiers: Book, Conservation, Ecology, Legislation, Man, Management, Resource, *Salmon, *Trout.

This book is designed to meet the needs of students in ecology, fishery management and regional planning, as well as for use by fishery proprietors, river authorities, district fishery boards, estate managers, angling associations and civil engineers. Part 1, entitled man and the resource, discusses salmon, trout and other members of the salmon family. The 2nd part, the biology of the resource, describes the life history and general characteristics of the Atlantic salmon, the sea trout and the brown trout, and also includes a short discussion on other members of the salmon family. Part 3, the environment, the resource and man, discusses the aquatic environment and man's activities and their effects on the environment and resource. Conservation and management resource is considered in part 4, including legislation and administration, controlling the effects of man's activities, managing the environment and the resource and management techniques. The final section, the future, provides for the development and regulation of salmon and trout in order to preserve and perpetuate these species. Appendix 1 includes a currency conversion table; appendix 2 contains a list of laboratories, institutions, universities and associations concerned with salmon and trout research; and appendix 3 includes a list of some scientific and semi-scientific journals publishing papers on salmon and trout. An extensive number of figures, tables and plates are included and the book ends with a list of references.--Copyright 1972, Biological Abstracts, Inc.
W73-05077

07. RESOURCES DATA

7B. Data Acquisition

UNDERESTIMATION OF STANDING CROP BY THE SURBER SAMPLER,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
R. L. Kroger.
Limnology and Oceanography, Vol 17, No 3, p 475-478, May 1972. 2 tab, 19 ref.

Descriptors: *Standing crops, Snails, Clams, Aquatic insects, Estimating, Biomass, Sampling, Pollutant identification, Gastropods, Mollusks, Stoneflies, Mayflies, Caddisflies, Diptera, Midges.
Identifiers: *Surber sampler, Jackson Lake, Snake River, Arachnids, Macroinvertebrates, *Underestimation, Alloperla, Isoperla, Ephemerella inermis, Baetis tricaudatus, Paraleptophlebia, Rithrogena hageni, Hydropsyche, Hydroptila, Glossosoma montana, Oecetis, Chironomidae, Simulium, Atherix variegata, Metachela, Elmidae, Acarina, Stagnicola bulimoides, Pisidium, Arthropods, Blackflies.

Before the flow of water from Jackson Lake into the Snake River was stopped by closure of a dam, invertebrates were collected in five Surber samples from a down-stream riffle. After the water had receded from the riffle, five 0.093-m sq areas of the exposed streambed substrate were hand-collected and the invertebrates removed. Predrawdown samples contained 4,286 invertebrates weighing 6.3 g while postdrawn samples contained 15,490 weighing 13.6 g. Large differences between submerged and exposed samples resulted from passage of smaller insects through the fine mesh of the Surber sampler and from backwash created by the sampler. The Surber sampler collected only about one-fourth of the invertebrates present in the 0.093-square meter areas. (Byrd-Battelle)
W73-04656

SIZE SEPARATION OF MARINE SESTON BY MEMBRANE AND GLASS-FIBER FILTERS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05A.
W73-04662

PORTABLE SPECTRORADIOMETER FOR UNDERWATER ENVIRONMENTS,
Simon Fraser Univ., Burnaby (British Columbia). Photobiology Group.
A. H. Burr, and M. J. Duncan.
Limnology and Oceanography, Vol 17, No 3, p 466-475, May 1972. 9 fig, 1 tab, 13 ref.

Descriptors: *Underwater, *On-site data collections, *Light intensity, *Light penetration, Aquatic environment, Design, Construction, Automation, Radiation, Equipment, Instrumentation, Euphotic zone, Reliability.
Identifiers: *Spectroradiometer, Precision, Detection limits, Sensitivity, Performance evaluation.

A battery-powered spectroradiometer is described which can be operated either manually or automatically in remote field applications. The submersible 6-kg probe is connected by cable to the control box on the surface with power supplied by 2 small 12-V storage batteries and a 6-V dry cell. The PIN photodiode measures, successively, the radiation transmitted by 16 interference filters and a 1 percent neutral density filter mounted in a rotating wheel. The probe can be easily maneuvered into restricted environments. The incident spectrum is determined by measuring successively through 16 interference filters transmitting in narrow wavebands from 401-698 nm. Minimum detectable spectral irradiance is 0.002-0.015 microW/sq cm/nm and is lowest at longer wavelengths. The instrument can measure with an accuracy of plus or minus 5 percent or less to depths where spectral irradiance is 0.03-1.2 percent of surface. Construction and operation details are included. (Holoman-Battelle)
W73-04665

TECHNIQUE FOR CHEMICAL IONIZATION OPERATION OF A CEC 21-110B MASS SPECTROMETER,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
T. J. Odiorne, and D. M. Desiderio.
Analytical Chemistry, Vol 44, No 11, p 1925-1926, September 1972. 1 fig, 3 ref.

Descriptors: *Spectrometers, *Methodology, *Instrumentation, Pressure.
Identifiers: *Chemical ionization mass spectrometry, Mass spectra.

In order to alleviate the problem of an inadequate conversion of the CEC 21-110B mass spectrometer to a chemical ionization operation, the original heated coverplate is being used again, and a small Vespel ferrule and an eighth-inch monel tube have been added. When operating the source at low pressures in the EI mode, the tube is used to simply conduct the gas from the coverplate to the source and all seals are more than adequate. At the higher pressures used for CI a similar tube is used, except with a crimp placed immediately behind the hemispherical nose and having a conductance of approximately .1 ml/sec. This provides a source pressure of 0.5 Torr with a pressure behind the crimp of 250 Torr, the higher pressure preventing high voltage breakdown of the gas. The ferrule is designed to use this pressure differential to the best possible advantage. It is necessary to custom-fit each ferrule to the individual coverplate. Monel was chosen due to its chemical inertness and high heat conductance. All that is necessary when changing from CI operation to EI (or vice versa) is to simply replace the tube with the appropriate one. (Holoman-Battelle)
W73-04684

ESTIMATES OF PRIMARY PRODUCTION OFF OREGON USING AN IMPROVED CHLOROPHYLL-LIGHT TECHNIQUE,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W73-04692

P-N JUNCTIONS INTERCHANGEABLE TEMPERATURE TRANSDUCERS,
Batelle-Northwest, Richland, Wash. Pacific Northwest Lab.
C. G. Enfield, and J. J. C. Hsieh.
Soil Sci. Vol 113, No 1, p 59-62. 1972. Illus.
Identifiers: *Instrumentation, Corrections, Junctions, Psychrometers, Soils, Temperature, Thermo-couple, *Transducers, Hygrometry, On-site investigations.

A satisfactory approach was found to make interchangeable diode temperature transducers using a common read-out circuit. These temperature transducers are being used as a means of correcting soil thermocouple psychrometers for differences in absolute temperature. This approach corrects for the length of cable being used and eliminates the need for individual calibration curves. The approach was used successfully on over 100 transducers installed in the field with lead lengths up to 175 m.–Copyright 1972, Biological Abstracts, Inc.
W73-04718

BENTHOS TRAPPED LEAVING THE BOTTOM IN BIDEFORD RIVER, PRINCE EDWARD ISLAND,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 02L.
W73-04727

REVIEW OF SPECIAL INSTRUMENTS AND EQUIPMENT USED IN WORLD HYDROLOGIC INVESTIGATIONS IN REPRESENTATIVE AND EXPERIMENTAL BASINS (OBZOR SPETSIAL'NYKH PRIBOROV I OBORUDOVANIYA, PRIMENYAYEMYKH V MIROVOY PRAKTIKE DLYA GIDROLOGICHESKIHK ISSLEDOVANIY NA REPREZENTATIVNYKH I EKSPERIMENTAL'NYKH BASSEYNAKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-04814

AN AUTOMATIC, MULTICHAMBER SOIL-WASHING APPARATUS FOR REMOVING FUNGAL SPORES FROM SOIL,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 05G.
W73-04820

AN INEXPENSIVE VERSATILE INCUBATOR FOR SOIL BIOLOGICAL RESEARCH,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
F. B. Dyck, C. A. Campbell, J. F. Weinberger, and V. O. Biederbeck.
Canadian Journal of Microbiology, Vol 18, No 9, p 1513-1517, September 1972. 5 fig, 5 ref.

Descriptors: *Incubation, *Automatic control, *Microorganisms, *Laboratory equipment, Cultures, Mechanical equipment, Instrumentation, Temperature, Design, Construction materials, Growth chambers.
Identifiers: Incubators.

A household freezer was converted to an inexpensive incubator by incorporating a heating system and a controller unit. The temperature was automatically varied sinusoidally over a 24-hr cycle or maintained at a constant level. Cost, excluding labor, was 400 dollars. The specifications are maximum and minimum temperatures, 38 and minus 21 C; maximum and minimum ranges of the sinusoidal temperature, 22 and 4 C; accuracy, plus or minus 0.5 C. (Little-Battelle)
W73-04822

STOMACHING: A NEW CONCEPT IN BACTERIOLOGICAL SAMPLE PREPARATION,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
For primary bibliographic entry see Field 05A.
W73-04823

AUTOMATED REACTION-RATE METHODS OF ANALYSIS,
Illinois Univ., Urbana. Roger Admas Lab.
H. V. Malmstadt, E. A. Cordos, and C. J. Delaney.
Analytical Chemistry, Vol 44, No 12, p 26A-32A, 36A, 38A, 40A-41A, October 1972. 9 fig, 31 ref.

Descriptors: *Automation, *Spectrophotometry, Computers, Instrumentation, Phosphates.
Identifiers: *Reaction rate analysis, Blood, Glucose, Sample preparation.

The inherent advantages and possible limitations of reaction-rate methods of analysis as compared to equilibrium methods are reviewed, and the general concepts of encoding reaction-rate information are presented. Much of the discussion is focused on the automated systems that make it possible to perform hundreds of accurate, sensi-

tive, and selective quantitative determinations per hour via rate data and to develop new methods more rapidly. (Little-Battelle)
W73-04825

MAXIMIZATION OF SENSITIVITIES IN TANTALUM RIBBON FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Instrumentation Lab., Inc., Lexington, Mass.
For primary bibliographic entry see Field 05A.
W73-04833

USE OF THE MICROWAVE-EXCITED EMISSIVE DETECTOR FOR GAS CHROMATOGRAPHY FOR QUANTITATIVE MEASUREMENT OF INTER-ELEMENT RATIOS,
Imperial Coll. of Science and Technology. London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04836

COMPOSITE DILATOMETER FOR MEASURING DENSITY OF LIQUIDS AND SOLIDS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
J. E. McKinney, and R. W. Penn.
The Review of Scientific Instruments, Vol 43, No 8, p 1211-1213, August 1972. 1 fig, 6 ref.

Descriptors: *Instrumentation, *Density, *Liquids, *Measurement, Physical properties, Design, Mechanical equipment.
Identifiers: *Dilatometers, *Precision.

A composite dilatometer was used to measure the densities of liquids and solids over a wide range of temperatures (minus 30 to 100 C) and pressure (limited to 800 bar). The dilatometer has a glass capillary and a mechanically removable seal at the base to facilitate loading. The seal is leakproof, and a constant volume is maintained with successive loadings. The dilatometer, as described, is applicable to substances that are solid at ambient conditions as well as for those with a phase transition into a liquid at other conditions. Using substances that are liquid at ambient conditions would involve minor modifications in the design and loading procedure. The principal advantage of the composite dilatometer is its convenience of assembly, which allows the same dilatometer to be used with sucessive samples. Since the volume remains essentially constant with successive loadings, it is possible to calibrate the dilatometer initially with mercury and apply this calibration to subsequent determinations. (Long-Battelle)
W73-04860

SEQUENTIAL ESTIMATION OF THE SIZE OF A POPULATION,
University Coll. London (England).
P. R. Freeman.
Biometrika, Vol 59, No 1, p 9-17, April 1972. 3 fig, 3 tab, 5 ref.

Descriptors: *Size, *Estimating, *Dynamic programming, Statistical methods, Sampling, Mathematical studies, Probability, Optimization, Estimating equations, Tagging.
Identifiers: *Finite population, *Sequential sampling, Bayesian inference, Standard deviation, Multiple sampling.

The problem of estimating the size of a finite population using sequential sampling is placed in a Bayesian framework, and an approximate numerical solution is obtained by the technique of truncated dynamic programming. The optical stopping boundaries are compared with those discussed by Samuel (1968, 1969). (Holoman-Battelle)
W73-04864

QUALITATIVE CONSEQUENCES OF RANDOMNESS IN A LINEAR KINETIC SYSTEM,
Rockland State Hospital, Orangeburg, N.Y. Div. of Theoretical Biokinetics.
For primary bibliographic entry see Field 05B.
W73-04865

A NEW TYPE OF PLANKTON PUMP ON THE VACUUM PRINCIPLE,
Kiel Univ. (West Germany).
J. Lenz.
Deep-Sea Research, Vol 19, No 6, p 453-459, June 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Plankton, *Biomass, *Sampling, Pollutant identification, Sea water, Filters, Copepods, Salinity, Depth, Daphnia, Data collections, Zooplankton, Water temperature, Efficiencies, Invertebrates, Evaluation, Equipment.
Identifiers: *Vacuum plankton pump, Vacuum pumps, Pleurobrachia, Acartia clausi, Calanus helgolandicus, Sarsia tubulosa, Halitholus cirratus, Ctenophores, Macroinvertebrates.

A new type of vacuum plankton pump is described including its advantages over existing sampling gear. This new model consists of three separate units: power and winch, tank, and filter units. In biomass studies, the pump as one type of gear for quantitative plankton sampling is in some respects superior to the water bottle and net, singly or in combination. The pump is used to suck sea water into two 500-litre tanks, which can be alternately filled to permit continuous sampling. The application of a vacuum offers several advantages, the chief being that the pumped organisms, not being forced to pass through the rotating mechanism of an impeller or centrifugal pump, are obtained in an undamaged state. There are three main limitations to the application of the plankton pump. The first, concerning sampling depth, is the difficulty of handling pipes longer than 100-200 m. The second drawback lies in the considerably smaller amount of water delivered by a pump when compared to the volume filtered by a larger net in the same time. Lastly, delicate organisms such as medusae and chaetognaths are often damaged by the rotating parts of an impeller or centrifugal pump. An additional cause of damage may lie in the strong frictional forces prevailing in the water while passing through the hose and pump at high speed. (Byrd-Battelle)
W73-04867

ON THE PROBLEM OF CALIBRATION,
Agricultural Research Council, Edinburgh (Scotland). Unit of Statistics.
G. K. Shukla.
Technometrics, Vol 14, No 3, p 547-553, August 1972. 13 ref.

Descriptors: *Calibrations, *Regression analysis, *Design criteria, *Estimating equations, Statistical methods, Variance, Methodology, Average, Mathematical studies.
Identifiers: *Mean square error, Bias, Errors, Sample size.

Efficiencies of classical and inverse regression methods of calibration have been discussed from the asymptotic expressions for bias and mean square error derived for the normal population with some other restrictions on the model (truncated). However, when the number of observations used in the calibration is small then for a suitable choice of independent variables the inverse estimator yields smaller mean square error for the estimator particularly for interpolation. In practice when large numbers of observations are used for calibration with small error and unknown X sub o is estimated by large number of observations on Y, it is unlikely that the inverse method will be advantageous over the classical method except in very trivial cases. In many cases it is not possible to take more than one observation on unknown X sub o, then, the inverse method of estimation is preferable when X sub o lies close to the mean of the design points so far as MSE is taken as criterion. However, for general purposes it is advisable to prefer an estimator with desirable properties (consistency) for large sample sizes which suggests the use of classical estimators in the absence of any prior information about unknown X sub o. (Holoman-Battelle)
W73-04878

SIZE-BIASED SAMPLING,
Florida Univ., Gainesville. Dept. of Statistics.
R. L. Scheaffer.
Technometrics, Vol 14, No 3, p 635-644, August 1972. 4 ref.

Descriptors: *Sampling, *Size, *Mathematical studies, Estimating equations, Mathematical models, Average, Particle size.
Identifiers: *Bias, *Sample size determination, Log-normal distribution, Weibull distribution, Gamma distribution.

Sampling components which are operating in a system at a fixed time and then observing the lifelengths of these components leads one to a length-biased sample. This concept is generalized to size-biased sampling, which often occurs when sampling multi-sized units such as particles. Estimators of average unit size are presented for the cases in which the underlying size distribution is gamma, Weibull or log-normal. These estimators, when specialized to the length-biased case, are shown to be improvements over some estimators already presented in the literature. Also, the problem of estimating mean life from backward recurrence times is discussed and some improved estimators are presented. (Holoman-Battelle)
W73-04881

MOISTURE SENSOR PLACEMENT FOR REGULATION OF FURROW-IRRIGATION SYSTEMS,
Valmont Industries, Valley, Nebr.
For primary bibliographic entry see Field 03F.
W73-04904

FIELD MEASUREMENT OF HYDRAULIC CONDUCTIVITY ABOVE A WATER TABLE WITH AIR-ENTRY PERMEAMETER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W73-05006

SOIL MOISTURE SAMPLING BY THE NEUTRON SCATTER TECHNIQUE,
Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div.
For primary bibliographic entry see Field 02G.
W73-05096

DEVELOPMENT OF A RADIOACTIVE ISOTOPE PROFILING SNOW GAGE,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W73-05105

CALCULATION OF THE ERROR FOR A ZOOPLANKTON COUNT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
S. Frontier.
J Exp Mar Biol Ecol. Vol 8, No 2, p 121-132. 1972. Illus. English summary.
Identifiers: *Counting methods, Distribution, *Error, Mathematical models, Plankton, Poisson, *Zooplankton.

The counts from a wide variety of plankton collections show a stochastic relation between mean and variance. The cubes of the values (except for very small numbers which are Poisson in their distribution) are Gaussian in their distribution with a stable variance and therefore the error at say the 95% probability level may be determined. The error for a given value, N, is a function of N and the relative error decreases rapidly as N increases, then very slowly so that it is not necessary to count more than 100 individuals in a given aliquot of the sample. At this limit the error (at the 95% level) of the total sample is about 31% of that of the fraction counted.--Copyright 1972, Biological Abstracts, Inc.
W73-05149

ANALYSIS OF THE ECOLOGY OF HYGROPHILOUS PLANTS OF THE FLOODPLAINS OF BASHKIR CISURALIA BY THE ORDINATION METHOD WITH THE USE OF INTERSPECIFIC ASSOCIATIONS, (IN RUSSIAN),
Bashkir State Univ., Ufa (USSR).
B. M. Mirkin, N. M. Must, and L. G. Naumova.
Ekologiya. Vol 1 No 6, p 32-36, 1970.
Identifiers: Associations, Bashkir, Cisuralia, Coefficients, Ecology, *Floodplains, *Hygrophilous plants, *Ordination method, Plants, USSR.

Cole's coefficient of interspecific association was used. The data showed mutual ordination of the 38 spp. studied.--Copyright 1972, Biological Abstracts, Inc.
W73-05154

7C. Evaluation, Processing and Publication

THEORY AND EXPERIMENTS IN THE PREDICTION OF SMALL WATERSHED RESPONSE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 02E.
W73-04625

OPERATING POLICIES FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04628

THERMAL POLLUTION REDUCTION BY ADIABATIC DEGASSING,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05D.
W73-04632

ECONOMIC ANALYSIS OF IRRIGATION SYSTEMS APPLICABLE TO THE NORTHERN PLAINS,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 03F.
W73-04634

DIGITAL SIMULATION OF UNSATURATED GROUNDWATER FLOW CONSIDERING EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02F.
W73-04639

TEST AND APPLICATION OF A COMPUTER MODEL DESCRIBING UNSATURATED GROUND WATER FLOW IN THE PRESENCE OF EVAPOTRANSPIRATION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 02F.
W73-04640

AN AUTOMATIC SYSTEM FOR THE CONTINUOUS DETERMINATION OF ORGANICS IN WATER AND WASTEWATER,
For primary bibliographic entry see Field 05A.
W73-04693

THE USE OF COMPUTERS IN PHILADELPHIA'S WATER POLLUTION CONTROL ACTIVITIES,
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 05G.
W73-04735

TRANSFORMATION OF DISCONTINUOUS ALLUVIAL WATER COURSES INTO UNIFORM SUBSTITUTE CHANNELS FOR CALCULATING THE SOLID'S DISCHARGE,
Technische Universitaet, Darmstadt (West Germany). Institut fuer Wasserbau und Wasserwirtschaft.
For primary bibliographic entry see Field 02J.
W73-04761

ON PRECIPITATION SENSOR NETWORK DENSITIES FOR EVALUATING WINTERTIME OROGRAPHIC CLOUD SEEDING EXPERIMENTS,
Colorado State Univ., Fort Collins. Dept. of Statistics.
For primary bibliographic entry see Field 03B.
W73-04791

AN ANALOG COMPUTER DEMONSTRATION OF DOUBLE-PEAKED INSTANTANEOUS UNIT HYDROGRAPHS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
M. H. Diskin, and J. R. McCarthy.
Water Resources Bulletin, Vol 8, No 6, p 1144-1156, December 1972. 11 fig, 2 tab, 11 ref.

Descriptors: *Unit hydrographs, *Analog computers, Analog models, Rainfall-runoff relationships, Simulation analysis, Hydrograph analysis, Model studies.

The properties of an instantaneous unit hydrograph model consisting of two cascades of linear reservoirs in parallel were explored with the aid of an analog computer. By proper choice of the model parameters it is possible to produce two-peaked instantaneous unit hydrographs. The relative magnitudes and locations of the two peaks can be varied by changing the values of the parameters. An example of the use of the analog computer to select the parameters of the model giving the best fit to an observed runoff hydrograph is also included. The analog computer used in the study was the ASTRAC II developed at the University of Arizona. (Knapp-USGS)
W73-04795

A PRECIPITATION ESTIMATION TECHNIQUE FOR DEVELOPING ISOHYETS IN AN ARID AREA USING VEGETATION AND TOPOGRAPHIC PARAMETERS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 02B.
W73-04796

A METHODOLOGY FOR ESTIMATING RESERVOIR OPERATION EFFICIENCY BENEFITS FROM SNOWMELT FORECASTING IMPROVEMENTS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 04A.
W73-04803

ESTIMATION OF MAXIMUM RUNOFF VOLUMES FOR SMALL PIEDMONT WATERSHEDS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 04A.
W73-04804

ESTIMATION OF MAXIMUM RUNOFF VOLUMES FOR SMALL PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W73-04805

RIVERS AND LAKES OF THE SOVIET UNION (REKI I OZERA SOVETSKOGO SOYUZA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. P. Domanitskiy, R. G. Dubrovina, and A. I. Isayeva.
Gidrometeoizdat, Leningrad, 1971. 104 p.

Descriptors: *Bodies of water, *Rivers, *Lakes, Reservoirs, Ponds, Hydrography, River basins, Watersheds (Basins), Drainage area, Areal, Dimensions, Gradation, Lake morphometry, Salinity, Water quality, Discharge (Water), Streamflow, Runoff, Data collections, Maps.
Identifiers: *USSR.

This inventory containing a list of rivers and lakes in the Soviet Union was compiled on the basis of records collected in 1960-66 by 34 administrations of the USSR Hydrometeorological Service under the direction of the State Hydrologic Institute in Leningrad. A detailed tabulation is made of rivers with their drainage area, length, and average annual discharge and of lakes with their surface area, depth, volume, and water-quality characteristics. The number of rivers in the Soviet Union is 2, 963,398 and their combined length is 9,647,864 km. The number of rivers < 10 km is 2,812,587 (combined length--5,624,881 km), and the number of rivers > 501 km is 260 (combined length--228,895 km). The number of lakes is 2,854,166 and their total water-surface area is 488,440 sq km. The number of lakes < 1 sq km is 2,814,727 (total surface area--159,532 sq km), and the number of lakes > 100 sq km is 187 (total surface area--185,920 sq km). The data obtained can be used to derive other hydrographic characteristics of rivers and lakes of the county and to develop a deeper understanding of water as a focus of geographical interest. (Josefson-USGS)
W73-04806

SYNCHRONY INDICES BASED ON COMPUTER-CORRECTED ALGAL CELL DATA,
Saint Louis Univ., Mo. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-04824

RATIO MATCHING--A STATISTICAL AID FOR DISCOVERING GENERIC RELATIONSHIPS AMONG SAMPLES,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05A.
W73-04827

COMPUTER CONTROLLED STROPPED-FLOW STUDIES - APPLICATION TO SIMULTANEOUS KINETIC ANALYSES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04828

CONVERSATIONAL MASS SPECTRAL RETRIEVAL SYSTEM AND ITS USE AS AN AID IN STRUCTURE DETERMINATION,
National Institutes of Health, Bethesda, Md. Div. of Computer Research and Technology.
For primary bibliographic entry see Field 02K.
W73-04829

COMPUTER ACQUISITION AND ANALYSIS OF GAS CHROMATOGRAPHIC DATA,
American Cyanamid Co., Stamford, Conn. Central Research Div. Labs.
R. A. Landowne, R. W. Morosani, R. A. Herrmann, R. M. King, Jr., and H. G. Schmus.
Analytical Chemistry, Vol 44, No 12, p 1961-1971, October 1972. 14 fig, 5 tab, 15 ref.

Descriptors: *Computers, *Automatic control, *Gas chromatography, Automation, Computer programs, Control systems, Data collections, Electronic equipment, Pollutant identification.
Identifiers: *Data acquisition, *Data interpretation.

A computerized system for a multiple instrument gas chromatographic laboratory is described. Simultaneous operation of all chromatographs is possible in real time even while the computer performs other functions. A set of resident programs controls the entire process which requires a minimal amount of operator interaction regardless of the complexity of the chromatographic analysis. In either method, development or routine analysis, only a few input parameters are required to choose several modes of data handling, with each instrument capable of operating in its own independent fashion. A teletypewriter is used almost exclusively for outputs of results, while most sample information and mode selection is entered through simple data switch boxes. Peak resolution and baseline determination is accomplished for almost all situations encountered without resorting to special routines. (Byrd-Battelle)
W73-04830

A SIMPLE COMPUTER-SPECTROPHOTOMETER INTERFACE,
Wake Forest Univ., Winston-Salem, N.C. Dept. of Physics.
R. C. Williams, and T. J. Turner.
The Review of Scientific Instruments, Vol 43, No 8, p 1207-1209, August 1972. 2 fig.

Descriptors: *Electronic equipment, *Digital computers, *Automatic control, Spectrophotometry, Instrumentation, Laboratory equipment, Automation, Interfaces, Data collections, Monitoring, Data processing, Optical properties, Analog computers.
Identifiers: *Computer-spectrophotometer interface, *Data acquisition, Analog to digital converters.

A simple, inexpensive technique is presented for interfacing a spectrophotometer to a digital computer thereby providing a data acquisition system. The interface system includes a voltage divider for the production of an analog signal, a relay system which initiates the computer operation and detects a change in optical density, a differential amplifier, and an analog to digital converter. (Mackan-Battelle)
W73-04859

GROWTH MODELS OF CULTURES WITH TWO LIQUID PHASES. VI. PARAMETER ESTIMATION AND STATISTICAL ANALYSIS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-04869

SUBSAMPLING A MIXTURE OF SAMPLED MATERIAL,
Commonwealth Scientific and Industrial Research Organization, Newtown (Australia). Div. of Mathematical Statistics.
G. H. Brown, and N. I. Fisher.
Technometrics, Vol 14, No 3, p 663-338, August 1972. 1 ref.

Descriptors: *Sampling, *Statistical methods, Quality control, Probability.
Identifiers: *Subsampling, *Composite samples, Precision, Variance.

The problem of estimating the mean of some characteristics from composited samples is considered. The composited samples are obtained by first randomly sampling a population of discrete units then subsampling each unit and mixing the subsample to form a composite sample. The statistical method which is developed permits the determination of the precision of the mean for a given number of observations or for specifying the number of observations required for given precision. The formulation is given in terms of variance components. Results are given for the case in which the composited material is not exhaustively subsampled. (Little-Battelle)
W73-04879

ALTERNATIVE MULTI-LEVEL CONTINUOUS SAMPLING PLANS,
Rutgers - The State Univ., New Brunswick, N.J. Statistics Center.
H. Sackrowitz.
Technometrics, Vol 14, No 3, p 645-652, August 1972. 5 ref.

Descriptors: *Quality control, *Statistical methods, Sampling.
Identifiers: Multilevel sampling, Precision, Continuous sampling.

Four multilevel sampling plans, two of which are newly developed, have been mathematically analyzed to compare their results. Each of the plans begins with 100 percent inspection and modifies the amount of subsequent sampling based upon the results obtained throughout the process. The new plans are different in that the type of partial ispection used depends not only on the occurrence of i consecutive non-defective items, but also on the length of time it takes to obtain this run of non-defectives. The new plans are shown to be identical to various existing multilevel continuous plans with respect to many mathematical characterizations. However, in some cases, they may be more desirable or easier to apply in practice. (Little-Battelle)
W73-04880

NUMERICAL ANALYSIS OF FREE SURFACE SEEPAGE PROBLEMS,
University Coll. of Swansea (Wales).
For primary bibliographic entry see Field 04A.
W73-04924

DYNAMIC SIMULATION OF PLANT GROWTH--PART II. INCORPORATION OF ACTUAL DAILY WEATHER AND PARTITIONING OF NET PHOTOSYNTHATE,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 02I.
W73-04988

SIMULATION VERSUS EXTREME VALUE ANALYSIS IN SPRINKLER SYSTEM DESIGN,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-04991

COMPUTER SIMULATION OF TILE SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-05005

CROP PRODUCTION SYSTEM SIMULATION,
Arizona Univ., Tucson. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-05008

ONE APPROACH TO IRRIGATION MODELING UNDER RISK,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 03F.
W73-05052

COMPUTERIZED PROCEDURE FOR ESTIMATING COSTS OF DESALTING SYSTEMS,
Banner (J. T.) and Associates, Inc., Brookings, S. Dak.
For primary bibliographic entry see Field 03A.
W73-05055

COMPUTER USE ON AN ENVIRONMENTAL ENGINEERING PROJECT,
Camp, Dresser and McKee, Boston, Mass., Dept. of Systems Development.
For primary bibliographic entry see Field 05G.
W73-05056

SELECTION OF MATERIALS, AN IMPROVED MODEL OF CHOICE,
For primary bibliographic entry see Field 06A.
W73-05058

EXPLORATION AND MAPPING OF SALISBURY PALEOCHANNEL, WICOMICO COUNTY, MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 04B.
W73-05110

08. ENGINEERING WORKS

8A. Structures

THE BALDWIN HILLS RESERVOIR FAILURE IN RETROSPECT,
Harvard Univ., Cambridge, Mass.
A. Casagrande, S. D. Wilson, and E. D. Schwantes, Jr.
Proceedings, American Society of Civil Engineers Special Conference on Performance of Earth and Earth-Supported Structures, Vol I, Part 1, Purdue Univ., Lafayette, Indiana, p 551-588, June 1972. 17 fig, 38 ref.

Descriptors: *Reservoir leakage, *Foundation failure, *Reservoir design, *Reservoir construction, Bibliographies, Linings, Earth dams, Foundation investigations, Faults (Geology), Geologic investigations, Geologic mapping, Drains, Geology, Flood damage, Land subsidence, Movement, Reservoirs.
Identifiers: *Piping (Erosion), Baldwin Hills Reservoirs (CA), Seismic investigations.

The failure of Baldwin Hills Reservoir on December 14, 1963, caused millions of dollars in property damage below the reservoir. Soon after the disaster, an investigation of the causes was begun, continuing until 1971. The project features and results of studies of site conditions before and after the failure are summarized. Topics discussed are: (1) site exploration and geology, (2) design and construction, (3) construction problems, (4) opera-

tion problems, (5) events on the day of failure, (6) field exploration after failure, (7) reservoir leakage problems, (8) settlement, and (9) horizontal measurement. Conclusions were that the failure was caused by foundation strata not only highly sensitive to erosion, but crossed by faults. Reservoir safety depended upon preventing water from entering these strata and faults, but certain design features intended to accomplish this instead substantially contributed to the failure processes. (USBR)
W73-04569

LOCATING AND SIZING AIR-RELEASE VALVES,
Golden-Anderson Valve Specialty Co., East Liverpool, Ohio.
J. E. Lescovich.
Journal of the American Works Association, Vol 64, No 7, p 457-461, July 1972. 7 fig, 1 photo.

Descriptors: *Pipelines, Pressure conduits, Closed conduit flow, Pumping, Hydraulic gradient, Hydraulic transients, Water hammer, Retardance, *Air entrainment, Hydraulics, Design criteria, Ventilation.
Identifiers: *Air release valves, *Entrapped air, Air admission, Air bubbles, *Vacuum breakers.

Designers often overlook the presence of air pockets at unsuspected locations in a pipeline as the cause of poor system performance. An erroneous assumption is that air release valves installed only at high points in the system will eliminate the problem of air entrapment. However, careful studies of pipeline ventilation may indicate the need for installing air release valves at locations other than just at high points. The ways in which air can enter a pipeline and the effects of air movement are explained. Three basic types of air release valves described are: (1) small orifice, (2) large orifice and vacuum, and (3) double or combination. Criteria are presented for selecting valve sizes. Curves included illustrate: (1) venting capacities and the diameter size required for small orifice valves, and (2) the diameter size for large orifice valves used to vent air during initial filling of the pipeline. (USBR)
W73-04577

PIPELINE PROBLEMS--BRITTLE FRACTURE, JOINT STRESSES, AND WELDING,
Department of Water and Power, Los Angeles, Calif.
R. V. Phillips, R. Triay, Jr., and S. M. Marynick.
Journal of the American Water Works Association, Vol 64, No 7, p 421-429, July 1972. 30 fig, 1 tab, 7 ref.

Descriptors: *Joints (Connections), *Welded joints, Expansion joints, Aqueducts, Metallurgy, Materials failure, Failure (Mechanics), Stress analysis, Steel pipes, Toughness, Pipelines, Thermal stress, Inspection, *Welding.
Identifiers: *Pipe design, *Pipe joints, Brittle fractures, Notch effect, Pressure pipes, Fillet welds, Impact loads, Fracture mechanics.

Since January 1970, 3 major circumferential pipeline breaks occurred near bell-and-spigot slip joints of the newly constructed Second Los Angeles Aqueduct. Each failure involved brittle fracture at the bell section of pipe near the toe of the inner weld, and occurred in sections of the 82-in.-dia, 15/16-in.-thick A-572 steel pipe. The fractures in the first 2 failures were triggered by physical and metallurgical notch effects at the toe of the welds. These notch effects resulted from scarfing, improper rewelding, and repairing of the scarfed area. In the third failure, a crack developed in the hard, heat-affected zone near the weld, and was propagated by underbead cracks. Since the failures occurred at relatively low steel temperatures, the A-572 steel was investigated and found highly susceptible to brittle fracture at temperatures below 35 deg F. Investigation of 60 internal field wash-pass welds indicated that this method produced poor welds. Preheating the steel and placing the weld in continuous stringer beads is recommended for future welding. Finite element stress analysis indicated high stress at the toe of the inner weld. (USBR)
W73-04578

NONSTATIONARY AUTO-EXCITED REGIME AND UNDERMINING OF PILES (REGIME NON-STATIONNAIRE AUTO-EXCITE ET AFFOUILLEMENT DES PILES),
Sherbrooke Univ. (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04772

AUTOMATION OF SURFACE IRRIGATION WITH FLUIDIC DIVERTERS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W73-04903

8B. Hydraulics

THE DISCHARGE OF SUBMERGED BUOYANT JETS INTO WATER OF FINITE DEPTH,
General Dynamics Corp., Groton, Conn. Electric Boat Div.
For primary bibliographic entry see Field 05B.
W73-04554

COMPUTER SIMULATION OF WATER-HAMMER EFFECTS,
G. Belonogoff.
Transportation Engineering Journal, American Society of Civil Engineers, Vol 98, No TE3, p 521-530, Aug 1972. 4 fig, 1 tab, 5 ref, 3 append.

Descriptors: *Water hammer, *Hydraulic transients, Computer models, Simulation, Cooling water, Hydraulic machinery, Hydraulic valves, Hydraulic conduits, Hydraulic design, Hydraulic models, Hydraulics, Powerplants, Air entrainment, Fluid mechanics, Air chambers, Pumps, Pipe flow, Head loss, Surge tanks.
Identifiers: Computer-aided design, Method of characteristics, Pipeline surges, Hydrodynamic pressure, Fluid dynamics.

The computer program described for simulating hydraulic transients (water hammer) in closed conduits is flexible enough to handle various hydraulic layouts. Boundary conditions available include; turbine installation, pumping station, valve houses, surge tanks, reservoirs, air chambers, and junction or bifurcation points. Output from the program gives a time history of pressure and flow at preselected points within the system. At the boundary conditions additional information, such as the time history of water levels, spill rate, and spill at surge chambers, is available. Information on turbomachinery speed, discharge, and head for each machine is also available within the water-hammer study. A summary is presented of maximum and minimum head and discharge throughout the hydraulic system. The program is based on the method of characteristics. (USBR)
W73-04576

THERMAL DISCHARGES INTO THE COASTAL WATERS OF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05B.
W73-04619

WATER SURFACE PROFILES IN DIVIDED CHANNELS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. B. Wylie.
Journal of Hydraulic Research, Vol 10, No 3, p 325-341, 1972. 9 fig, 1 tab, 10 ref.

Descriptors: *Open channel flow, *Flow profiles, *Mathematical models, Computer models, Model studies, Computer programs, Discharge (Water), Networks, Continuity equation.
Identifiers: *Divided channels.

An analytical procedure is presented to model steady-state subcritical free surface flow in divided channel systems. An iterative procedure solves the nonlinear equations on a digital computer. Initial assumptions of the energy level in the system are needed. By beginning with these initial guesses the iterative procedure converges quickly to the final steady-state energy level and flow distribution in the system. (Knapp-USGS)
W73-04738

SOME OBSERVATIONS ON THE MOTION OF THE HEAD OF A DENSITY CURRENT,
Nation Research Council of Canada, Ottawa (Ontario). Hydraulics Lab.
D. L. Wilkinson, and I. R. Wood.
Journal of Hydraulic Research, Vol 10, No 3, p 305-324, 1972. 9 fig, 17 ref, 2 append.

Descriptors: *Density currents, *Model studies, Hydraulic models, Density, Currents (Water), Density stratification.

A series of experiments showed the basic mechanics of density fronts, their form, and their motion. The experiments were carried out in a long gently sloping flume with the dense fluid (salt water) flowing under a lighter fluid (fresh water). A density front moving down a gentle incline is ultimately friction controlled and its velocity will asymptotically approach the uniform flow velocity in the following density current. Boundaries in the form of rigid surfaces or density inversions in the ambient fluid can have a pronounced effect on the motion, energy dissipation and shape of a density front. Generally the presence of such a boundary will cause a reduction in the velocity and height of the front relative to a similar front moving under a deep homogeneous layer. (Knapp-USGS)
W73-04739

ON PRESERVING THE SAND PATTERNS IN RIVER MODELS,
Khartoum Univ. (Sudan).
M. B. Khalil.
Journal of Hydraulic Research, Vol 10, No 3, p 291-303, 1972. 4 fig, 5 ref.

Descriptors: *Hydraulic models, *Open channels, *Channel morphology, *Resins, Model studies, Laboratory tests, Equipment, Sediment transport, Sedimentology, Sedimentary structures.

A new method for preserving the hydraulic features of river and other models uses a water-soluble resin, which is subsequently polymerized by formic acid. When the water content of the sand is about 10% of the total volume, sufficient dilute resin is applied to saturate the topmost inch of sandy bed. After 10 minutes required for resin to infiltrate to the required depth, the sand is finally solidified by spraying with formic acid. The resulting rock-like bed, having an unchanged hydraulic roughness can then be investigated hydraulically to reveal actions previously hidden by causes such as the growth or migration of shoals and deeps. The method yields solidified beds which have withstood nearly 3 years of experiments often with water speeds far greater than those which scoured and built the original bed. (Knapp-USGS)
W73-04740

A NUMERICAL SIMULATION OF THE UNDULAR HYDRAULIC JUMP,
M. B. Abbott, and G. S. Rodenhuis.
Journal of Hydraulic Research, Vol 10, No 3, p 239-257, 1972. 6 fig, 30 ref.

Descriptors: *Hydraulic jump, *Mathematical studies, Hydraulics, Simulation analysis, Critical flow, Continuity equation, Surges, Waves (Water).

Computed undular hydraulic jumps are compared with published experimental results. The published experiments showed that when the ratio of depths was less than about 1.28, the jump advancing into still water maintained a purely undular character, without breaking of any of the waves. As the ratio increased above 1.28 breaking became increasingly prominent, extending further and further back from the head of the jump and inducing increasingly intense turbulence within the body of the jump. Solutions of the Boussinesq system of equations are exceedingly sensitive to restrictive assumptions (such as steadiness) and errors (such as truncation error). Numerical solutions of such systems must herefore be filtered in order to obtain physically realistic values of wavelengths and wave amplitudes. This sensitivity to small perturbations appears to continue characteristics intersect. Thus this analysis, assuming an ideal fluid, yields a depth ratio of 1.19 as the highest that would have no breaking. For an ideal fluid, there exists no critical depth ratio; all undular jumps will ultimately break. However, this breaking may be delayed or even suppressed compiely by a suitable generation of shear stresses and, perhaps, by boundary layer formation (energy concentration), over a considerable range of depth ratios. (Knapp-USGS)
W73-04741

CRITICAL SHEAR STRESS FOR SEDIMENT MIXTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W73-04742

CRITICAL MEAN EROSIVE FORCE, CONSIDERING FLUCTUATIONS DUE TO TURBULENCE, OF THE EROSIVE FORCE ACTING ON AN ALLUVIAL BED (FORCE D'ENTRAINEMENT MOVENNE CRITIQUE, AVEC PRISE EN CONSIDERATION DES FLUCTUATIONS DUES A LA TURBULENCE, DE L A FORCE D'ENTRAINEMENT AGISSANT SUR LE MATERIAU D'UN LIT ALLUVIONNAIRE),
Eidgenoessische Techische Hochschule, Zurich (Switzerland). Lab of Hydraulic Research and Soil Mechanics.
For primary bibliographic entry see Field 02J.
W73-04743

THE EFFECT OF HIGH TURBULENCE ON EROSION OF ALLUVIUM (L'INCLUENCE DE LA HAUTE TURBULENCE SUR L'ENTRAINEMENT DES ALLUVIONS),
Institutul de Studii si Cercetari Hidrotehnice, Bucharest (Rumania.
For primary bibliographic entry see Field 02J.
W73-04744

PROGNOSIS OF GENERAL DEFORMATION OF NATURAL AND ARTIFICIAL ALLUVIAL BEDS COMPOSED OF NON-UNIFORM MATERIAL,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
For primary bibliographic entry see Field 02J.
W73-04745

NATURAL ARMOURING AND ITS EFFECT ON DEFORMATIONS OF CHANNEL BEDS FORMED BY MATERIALS NON-UNIFORM IN SIZE,
Politekhnicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-04746

DEFORMATION OF ALLUVIAL BEDS COMPOSED OF MATERIALS OF EXTENDED GRANULOMETRY (DEFORMATION DES LITS ALLUVIONNAIRES COMPOSES DE MATERIAUX A GRANULOMETRIE ETENDUE),
Ecole Nationale Superieure d'Hydraulique de Grenoble (France).
For primary bibliographic entry see Field 02J.
W73-04747

VARIATION OF BED FORM AND FLOW RESISTANCE IN ALLUVIAL CHANNELS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W73-04751

ON THE OCCURRENCE OF BED FORMS IN ALLUVIAL CHANNELS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W73-04752

DEFORMATION OF ALLUVIAL BEDS IN THE CURVES OF RIVERS (DEFORMATION DES LITS ALLUVIONNAIRES DANS LES COUDES DES RIVIERES),
For primary bibliographic entry see Field 02J.
W73-04755

INFLUENCE OF BRANCHES OR OF DIVERSIONS ON THE EVOLUTION AND EQUILIBRIUM OF ALLUVIAL BEDS (INFLUENCE DE DERIVATIONS OU DE BIFURCATIONS SUR L'EVOLUTION ET L'EQUILIBRE DE LITS ALLUVIONNAIRES),
For primary bibliographic entry see Field 02J.
W73-04757

ON DOMINANT DISCHARGE CONCEPTS FOR RIVERS,
Technische Hogeschool, Delft (Netherlands).
A. Prins, and M. de Vries.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 161-170, 1972 (release date). 11 fig, 1 tab, 9 ref.

Descriptors: *Sediment transport, *Mathematical models, *Hydraulic models, Regime, *Discharge (Water), Sedimentation, Scour, Stream erosion, Channel erosion, Bed load, Alluvial channels, Sedimentology.
Identifiers: *Dominant discharge.

The concept 'dominant discharge', widely used for attempts to schematize a river regime into one single discharge, is reviewed. Nonsteady hydrodynamic equations are suggested for a realistic approach of the matter. This approach is a logical consequence of the development of methods for the computation of bed-fluctuations under the influence of natural or artificial changes of the conditions for a river reach. Combined use of mathematical and hydraulic river models is possible, taking the advantages of each of those models and mutually compensating their disadvantages. The resulting mathematical model can be used to schematize the regime of a river for use in a hydraulic model. In the mathematical model, variation with time can easily be obtained, while the hydraulic model gives information of the parameters across space; variation with time is more difficult to obtain. (Knapp-USGS)
W73-04758

CALCULATION OF RIVER BED DEFORMATION IN UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 02J.
W73-04760

GEOMETRIC PARAMETERS FOR ALLUVIAL RIVERS RELATED TO REGIONAL GEOLOGY,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-04762

CAUSES OF LOCAL CHANGES OF THE LEVEL OF REGULATED ALLUVIAL RIVER BEDS AND THE ELABORATION OF COUNTER MEASURES BY MEANS OF RIVER SCALE MODEL TESTS (ILLUSTRATED ON THE EXAMPLE OF THE ELBE RIVER),
Forschungsanstalt fuer Schiffahrt, Wasser- und Grundbau, Berlin (West Germany).
G. Glazik.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 203-211, 1972 (release date). 1 fig, 7 ref.

Descriptors: *Model studies, *Surveys, *Alluvial channels, *River training, Geomorphology, Channel morphology, Regimen, Hydraulic models, Water levels, Sediment load, Hydraulic design, Flood control, Channel improvement.
Identifiers: *Elbe River (Germany).

A detailed analysis was made of changes of the level of water and river bed on selected reaches of the Elbe River, Germany, resulting from river training work, diking, and changes of slope by geological influences. Hydraulic scale model tests have contributed to an explanation of the mechanism of bed changes and suggest those structural counter measures that are most suitable both in technical and economical respect. (Knapp-USGS)
W73-04763

THE INFLUENCE OF AN ISLAND AT THE MOUTH OF A CUTOFF OF A LOOP ON THE DEFORMATION OF THE BED OF WATER COURSE (L'INFLUENCE D'UN ILOT A L'EMBOUCHURE D'UNE COUPURE DE BOUCLE SUR LA DEFORMATION DU LIT D'UN COURS D'EAU).
Robert Coll., Istanbul (Turkey).

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 213-220, 1972 (release date). 7 fig.

Descriptors: *Sediment control, *River training, *Sediment transport, *Bypasses, *Cutoffs, Meanders, Channel morphology, Regulation, Stream stabilization, Sediment load, Sedimentology.

The influence of cutting a bend in a natural alluvial channel is reviewed. The introduction of an artificial island can solve many of the problems in channel straightening. The form is worked out in such a way that the partition of liquid and solid discharges is controlled. An adequate solid discharge may be provided for the main course of the river and for the cutoff channel so that equilibrium in both branches is assured. (Knapp-USGS)
W73-04764

A STUDY OF THE OPTIMAL SECTION OF A PILOT CHANNEL FOR A CUTOFF OF A MEANDER (RECHERCHE DE LA SECTION OPTIMALE D'UN CHENAL-PILOTE POUR UNE COUPURE DE MEANDRE)
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 221-228, 1972 (Release date). 2 fig, 1 ref.

Descriptors: *Sediment control, *River training, *Sediment transport, *Bypasses, *Cutoffs, Meanders, Channel morphology, Regulation, Stream stabilization, Sediment load, Sedimentology.

A meander cutoff can be initiated by digging a pilot channel the breadth of which will be increased by the erosional action of the water. A method is given to compute the smallest section to be given to this channel in order to insure velocity high enough to enable erosion in the cutoff, to insure velocity in the meander low enough to enable sedimentation, and not to raise the upstream water levels. This computation is based upon the use of the continuity equation and the Strickler flow equations in the cutoff and in the meander. The proposed method is illustrated with example calculations. (Knapp-USGS)
W73-04765

AN INVESTIGATION OF RIVER BED DEGRADATION DOWNSTREAM OF A DAM,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
K. Ashida, and M. Michiue.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 247-255, 1972 (release date). 9 fig, 1 tab, 4 ref.

Descriptors: *Scour, *Alluvial channels, *Degradation (Stream), *Particle size, Model studies, Hydraulic models, Channel morphology, Stream erosion, Channel erosion, Shear stress, Sediment transport.
Identifiers: Sedimentary armoring, Critical shear stress (Scour).

Degradation of a river bed composed of graded material downstream of a dam was determined on the basis of theoretical and model studies of bedload transportation for nonuniform sediment. The effect of nonuniformity of the material on the bedload transportation can be expressed by the difference of the threshold condition of movement for each grain size. The process of river-bed degradation can be treated by using a representative diameter for the sediment mixture when the material of every grain size is in the moving state. When some parts of the bed material are under the threshold condition of movement an armor coat is formed. A method is proposed to predict the grain size frequency distribution of the armor coat and to estimate the amount of river bed degradation on the basis of an analytical model. (Knapp-USGS)
W73-04767

PREDICTION OF RIVER-BED DEGRADATION BELOW DAMS,
Gifu Univ. (Japan). Dept. of Civil Engineering.
S. Komura.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 257-264, 1972 (release date). 3 fig, 1 tab, 9 ref.

Descriptors: *Scour, *Alluvial channels, *Degradation (Stream), *Particle size, Model studies, Hydraulic models, Channel morphology, Stream erosion, Channel erosion, Shear stress, Sediment transport.
Identifiers: Sedimentary armoring, Critical shear stress.

A differential equation for the rate of river-bed degradation is obtained from the equation of continuity for sediment transport and an equation of motion for sediment transport. The armoring effect for nonuniform bed material, which is an important factor in the analysis of degradation problems, is included in this analysis. By using the differential equation for degradation, methods were developed of predicting the river-bed degradation below dams in the transient phase. Computational equations and the procedure of computation for a final equilibrium profile of river bed are described. (Knapp-USGS)
W73-04768

DEFORMATION OF ALLUVIAL CHANNEL DOWNSTREAM FROM LARGE HYDRO-PROJECTS,
Universitet Druzhby Narodov, Moscow (USSR).
N. A. Rzhanitzin, E. K. Rabkova, and P. A. Artemiev.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 265-274, 1972 (release date). 10 fig, 2 ref.

Descriptors: *Scour, *Alluvial channels, *Degradation (Stream), *Particle size, Model studies, Hydraulic models, Channel morphology, Stream erosion, Channel erosion, Shear stress, Sediment transport.
Identifiers: Sedimentary armoring.

Long-period investigations were made of a number of problems related to the influence of water flow control upon the channel downstream from a hydro-project. The data on the laboratory and field investigations of scour processes are given, and the typical patterns of deformations of the channel are derived. A method for the computation of the new channel forms takes into consideration the influence of soil heterogeneity upon the scour depth and building of channel pavement. A new method is proposed for the computation of the water levels downstream of hydro-projects as affected by channel scour. The reliability of computing methods is confirmed by actual data from existing hydro-projects. (Knapp-USGS)
W73-04769

RIVER-BED DEGRADATION DOWNSTREAM OF DAMS,
State Hydraulic Works, Ankara (Turkey).
S. Aksoy.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 275-282, 1972 (release date). 3 fig, 6 ref.

Descriptors: *Scour, *Alluvial channels, *Degradation (Stream), *Particle size, Model studies, Hydraulic models, Channel morphology, Stream erosion, Channel erosion, Shear stress, Sediment transport.

The prediction of river-bed degradation downstream of large dams is a subject of increasing interest for engineers today. Because the mechanics of sediment movement by gradually varied unsteady flow is not known, present analyses are not yet capable of describing the degradation of bed. There are methods of empirical or semi-empirical nature. Study of the degradation problem can be greatly simplified if it is assumed that the sediment is kept completely in the reservoir, the river strech between the dam and the control section is straight, the banks are not erodible, variation of discharge does not occur, the river bed material is completely homogenous with depth, and the sediment transportation occurs only as bedload movement. (Knapp-USGS)
W73-04770

EFFECT OF FLOW VARIATION DOWNSTREAM OF A POWER PLANT ON THE BEDLOAD DISCHARGE OF ALLUVIAL RIVERS,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
M. Bozinovic.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 283-290, 1972 (release date). 15 fig, 1 ref.

Descriptors: *Bed load, *Sediment transport, *Unsteady flow, *Water level fluctuations, Hydroelectric plants, Regulation, Particle size, Sediment discharge, Sediment load, Scour, Erosion, Channel erosion, Alluvial channels.

Hydropower plants influence the natural regimen of sediment transport. Of particular significance are the effects of the powerplants operating with daily discharge peaks causing downstream periodic waves. Bed-load transport was analyzed as a function of the wave type (form of hydrograph), of sediment grain size, and river bed geometry. Results were compared with the channel transport capacity at steady flow with the same water balance but without artificially produced waves. Special attention was paid to the problems of field investigations of sediment transport under described conditions of rapid changes of water levels discharge and sediment grain size. Periodic waves caused by powerplant operation may under certain conditions provoke a considerable increase of the total daily bed load balance in relation to the corresponding balance in steady flow. If such waves occur during a longer time interval then they may considerably influence the total annual bed load balance. (Knapp-USGS)
W73-04771

NONSTATIONARY AUTO-EXCITED REGIME AND UNDERMINING OF PILES (REGIME NON-STATIONNAIRE AUTO-EXCITE ET AFOUILLEMENT DES PILES),
Sherbrooke Univ. (Quebec). Dept. of Civil Engineering.
B. Gallez, and J. N. Butte.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 291-305, 1972 (release date). 14 fig, 1 ref.

Descriptors: *Flow around objects, *Scour, *Alluvial channels, *Piers, Waves (Water), Water level fluctuations, Unsteady flow.
Identifiers: Flow between piers.

The flow between bridge piers causes predictable periodical oscillations of the free surface. In this case, the structure of the wake is radically modified and local scour is accelerated. In an experimental investigation with round-nosed piers, the loose bed was made of sand with little dispersion in granulometry. The model was operated without general bed transport. (Knapp-USGS)
W73-04772

ANALYZING LABORATORY MEASUREMENTS OF SCOUR AT CYLINDRICAL PIERS IN SAND BEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
N. L. Coleman.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 307-313, 1972 (release date). 4 fig, 6 ref.

Descriptors: *Scour, *Piers, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Flow around objects, Dimensional analysis, Hydraulic models.

Identifiers: *Scour at piers.

The problem of defining the ultimate or equilibrium scour depth at a cylindrical pier is attacked by means of dimensional analysis. An appropriate Euler number is formulated, and its behavior--as functions of pier Reynolds number, pier Froude number, relative approach flow depth, and relative bed material size--is investigated using laboratory data. From the nondimensional functions an equation is derived that relates the scour depth to the pier diameter and the velocity head of the approach flow. (Knapp-USGS)
W73-04773

UNDERMINING NEAR CIRCULAR CYLINDRICAL BRIDGE PILES (AFFOUILLEMENTS AU VOISINAGE DE PILES DE PONT CYLINDRIQUES CIRCULAIRES),
Laboratoire National d'Hydraulique, Chatou (France).
G. Nicollet, and M. Ramette.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 315-322, 1972 (release date). 4 fig, 3 ref.

Descriptors: *Scour, *Piers, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Flow around objects, Dimensional analysis, Hydraulic models.
Identifiers: *Scour at piers.

Experimental investigation yielded a diagram which can be used for predicting the maximum scour depth around a circular cylindrical pier with a sand of uniform texture, whatever the flow. The validity of this diagram was verified for a sand of mixed texture, by taking the medium size as characteristic parameter. Tests with different bed materials did not give any significantly different results from those obtained with sand. (Knapp-USGS)
W73-04774

SETTLEMENT OF A CYLINDRICAL BODY PLACED ON THE SURFACE OF AN ALLUVIAL RIVER BOTTOM,
Hydraulic Research Inst., Prague (Czechoslovakia).
Z. Thomas.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 331-338, 1972 (release date). 2 fig, 2 ref.

Descriptors: *Scour, *Piers, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Flow around objects, Dimensional analysis, Hydraulic models.
Identifiers: *Scour at piers.

The settlement of a cylindrical body placed on the alluvial bottom of a river was investigated, and the equation for this phenomenon was derived. The conditions for the similarity of the stress distribution in the soil under the weight of an isolated load and the resulting equation for the calculation of the load of the pier model were also derived. The magnitude of the pier load is not the most important factor which affects the magnitude of the pier settlement. Pier settlement is increased by the erosive activity of the vortices under sand waves and is decreased by discharge of bedload. (Knapp-USGS)
W73-04775

SIMILARITY LAWS FOR LOCAL SCOUR WITH SPECIAL EMPHASIS ON VERTICAL CIRCULAR PILE IN OSCILLATORY FLOW,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
H. D. Altinbilek.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 339-346, 1972 (release date). 4 fig, 4 ref.

Descriptors: *Scour, *Piers, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Flow around objects, Dimensional analysis, Hydraulic models.
Identifiers: *Scour at piers.

Prediction of the extent of the local scour that takes place around hydraulic works is important in the design and operation of these structures. A rational method which is based upon the conservation of mass with the scour hole as the control volume may be used to compute the development of local scour using the results of experimental studies. The general method presented is applicable to all local scour situations. The application of the general method is demonstrated for the localized scour which develops around a single vertical circular cylinder in a cohesionless bed in oscillatory flow. Model tests were performed utilizing an oscillatory-flow water tunnel. Two sizes of bed material and six sizes of cylindrical pile were tested. Measured scour depth is compared with the predicted scour depth for 24 model tests. General scour-depth-versus-time curves were prepared. The terminal scour depth and the influence of the bed forms upon the localized scour around a circular cylinder are discussed. (Knapp-USGS)
W73-04776

TIME DEVELOPMENT OF THE DEFORMATION OF AN ALLUVIAL BOTTOM,
Hydraulic Research Inst., Prague (Czechoslovakia).
Z. Thomas.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 347-354, 1972 (release date). 2 fig, 4 ref.

Descriptors: *Scour, *Piers, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Flow around objects, Dimensional analysis, Hydraulic models.
Identifiers: *Scour at piers.

Experiments with hydraulic structures show that the time relationship of the average rate by which the depth of the local scour and the settlement of bodies situated on the surface of the bed load of a river is governed by exponential laws. These laws are general laws by which the deformation of the alluvial bottom spreads. Directions on how to use these laws to interpret the scour measurements on models and on prototype are given. (Knapp-USGS)
W73-04777

LOCAL SCOUR AND SCOURING EFFECTS ON SEWER OUTFALLS,
Lund Inst. of Tech. (Sweden).
P. Hjorth.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 355-362, 1972 (release date). 5 fig, 5 ref.

Descriptors: *Scour, *Flow around objects, *Outlets, *Channel erosion, *Alluvial channels, Sedimentology, Sediment transport, Stream erosion, Hydraulic models.
Identifiers: *Flow at outlets, *Scour at outlets.

The local scour process around an obstruction in a stream depends on the flow characteristics in the near vicinity of the obstruction. For a correct prediction of the extension of scour it is necessary to acquire a thorough knowledge of the flow pattern including vortices and separation generated by the obstruction. Tests were carried out with obstacles in steady flow in a model with fixed bottom in order to find relationships between the characteristics of the approach flow and the flow pattern around the obstacle. Among the characteristics studied are velocity distribution, turbulence intensity distribution and spectral composition of the turbulent energy. The presence of an obstruction affects the vertical velocity distribution relatively far upstream from the obstruction, and the influence is first noticed at the bottom but goes higher and higher up as the flow approaches the obstacle. The influence is only noticed on the mean velocity while the turbulence level is only affected in the near vicinity of the obstruction. The horizontal velocity distribution is strongly affected close to the obstruction where strong gradients can be observed but outside this area no such gradients are observed. (Knapp-USGS)
W73-04778

STUDY OF PROCESSES OF LOCAL UNDERMINING OF HETEROGENEOUS FINE--GRAINED SOILS DOWNSTREAM OF THE BACK APRON OF DIVERSION BARRAGES (ETUDE DU PROCESSUS D'AFFOUILLEMENT LOCAL DES SOLS A GRAINS FINS HETEROGENES A L'ALVAL DES ARRIERE--RADIE RS DES BARRAGES-DEVERSOIRS),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).
F. G. Gunko, and K. S. Popova.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 371-378, 1972 (release date). 5 fig, 3 ref.

Descriptors: *Scour, *Spillways, *Stream erosion, Particle size, Turbulence, Turbulent flow, Sediment transport, Sedimentology, Alluvial channels, Degradation (Stream).
Identifiers: *Sedimentary armoring.

Experimental studies were made to determine local scour of movable bed material downstream from medium-head spillways. The results are plotted in graphs which show, for the case of a two-dimensional problem, the location and the depth of the maximum scour as well as the degree of denudation at the end of the apron (if it terminates in a vertical wall) as a function both of the turbulence characteristics of the flow leaving the horizontal portion of the apron and the characteristics of the erodible soil. As the bed is scoured it is paved with course particles of eroded material. (Knapp-USGS)
W73-04779

DEVELOPMENT IN A RIVER OF ARTIFICIAL SALMON POOLS BY USE OF FLOW CONTRACTIONS (DEVELOPPEMENT EN RIVIERE DE FOSSES ARTIFICIELLES A SAUMON A L'AIDE DE CONTRACTIONS DE L'ECOULEMENT),
Cardeau, Inc., Quebec.
For primary bibliographic entry see Field 08I.
W73-04780

STUDY OF LOCAL SCOUR AND KINEMATIC STRUCTURE OF FLOW AROUND SOLID AND THROUGH SPUR-DIKES,
Sredneaziatskii Nauchno-Issledovatelskii Institut Irrigatsii, Tashkent (USSR).
A. M. Mukhamedov, R. R. Abduraupov, Kh. A. Irmukhamedov, O. A. Kayumov, and R. Urkinbaev.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 389-396, 1972 (release date). 6 fig, 7 ref.

Descriptors: *Scour, *River training, *Channel morphology, *Underseepage, *Dikes, Flow around objects, Channel erosion, Flow, Alluvial channels.
Identifiers: *Spur dikes.

Results are presented of theoretical and experimental studies on deformations (local scour) of a river channel bottom and the kinematic structure of a water flow near the solid and through spur-dikes. The investigations helped to find the effect of principal factors on the depth of local scour and the kinematic and hydraulic properties of the flow passing the scour zone. Based on the above investigations new calculation procedures were developed for the determination of the depth of scour near solid and through spurdikes. (Knapp-USGS)
W73-04781

DEFORMATION OF ALLUVIAL BEDS AS A CONSEQUENCE OF THE DISCONTINUANCE OF STRONG FLOWS (DEFORMATION D'UN LIT ALLUVIAL EN CONSEQUENCE D'UNE DISCONTINUITE DES DEBITS SOLIDES),
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
M. Pirkovsky.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 397-434, 1972 (release date). 6 fig.

Descriptors: *Degradation (Stream), *Channel erosion, *Alluvial channels, *Bed load, *Sediment transport, Water levels, Regimen, Erosion, Sedimentology.

Methods of computing the river bed degradation and water level decrease under simplified conditions according to the Bernouilli's equation are based on knowledge that the dimensionless parameter of the bedload movement changes along the scour within the known ranges by a simple function. In consideration of this the river bed and the water level course can be directly computed. The considerations are based on experimental research results. (Knapp-USGS)
W73-04782

SEASONAL VARIATION OF HYDRAULIC PARAMETERS AND THEIR INFLUENCE UPON SURFACE IRRIGATION APPLICATION EFFICIENCY,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 03F.
W73-04996

SUPERCRITICAL FLOW IN RECTANGULAR EXPANSIONS,
TEXAS A and M Univ., College Station.
J. B. Herbich, and P. Walsh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, p 1691-1700, Sept 1972. 9 fig, 10 ref, 2 append.

Descriptors: *Hydraulic models, *Supercritical flow, *Mathematical models, Computer models, Standing waves, High velocity, Froude number, Critical flow, Hydraulic gradient, Transition flow, Friction coefficient (Hydraulic), Boundary layers, Air entrainment, Hydraulics, Hydraulic design, Fluid mechanics, Expansion.
Identifiers: Method of characteristics, Flow depth, Water surface profiles.

Mathematical and hydraulic model studies were performed to test the suitability of the method of characteristics for predicting the form of supercritical flow induced downstream of a gradual expansion in a flume. Because of standing waves, supercritical flow presents a formidable problem to the designer. A mathematical model used a Fortran program, and considered initial depth, velocity, channel slope, and angle of transition. The hydraulic model used a 20-ft flume of variable slope, flow depths from 0.5 to 2.4 in., velocities from 0 to 10 fps, slopes from 0 to 15%, and transitions from 1 to 30 deg. When expansion exceeded 5 deg, separation occurred and flow was non-hydrostatic. On steep slopes, vertical acceleration became significant, increasing energy and decreasing flow depth. For slopes over 15 deg, air entrainment increased flow depths considerably. Mathematical and hydraulic model results did not agree because friction had been assumed negligible in the former. Larger discrepancies were revealed for slight slopes than for medium slopes. The method of characteristics needs redevelopment to include friction. (USBR)
W73-05063

8C. Hydraulic Machinery

SEWER CONTROL AND PLANT AUTOMATION,
Watermation Inc., St. Paul, Minn.
For primary bibliographic entry see Field 05D.
W73-04737

LARGE PUMPING STATIONS,
Baubehorde (West Germany). Hauptabteilung Stadtenwasserung.
E. Sickert.
Water Research, Vol 6, p 381-385, 1972. 2 fig, 2 tab.

Descriptors: *Pumping, *Pumping plants, *Water conveyance, *Sewage, *Waste water, *Centrifugal pumps, Hydraulic systems, Costs.
Identifiers: *Hamburg (Germany), *Single shovel pump, *Screw pump.

The development of the single shovel pump in the past few years has made it possible to install fully automatic pumping stations without screens or prechambers, therefore, providing reliability and low maintenance. However, for higher pumping capacities centrifugal pumps or screw pumps must be used. A cost comparison of screw pump construction and operating costs versus centrifugal pump construction and operating costs indicate that screw pumps were much more economical. (Smith-Texas)
W73-05015

RESEARCH ON COMPACT TRANSMISSION LINES IN ONTARIO,
Hydro-Electric Power Commission of Ontario, Toronto.
J. G. Cassan, and O. Nigol.
Paper 31-07, International Conference on Large High Tension Electrical Systems (CIGRE), Paris, France, Aug-Sept 1972. 9 p, 6 fig.

Descriptors: *Transmission towers, *Electric insulation, *Design criteria, Extra high voltage, Transmission lines, Aesthetics, High voltage, Right-of-way, Extra high voltage, On-site laboratories, Electrical insulators.
Identifiers: *Canada, *Switching surges, Analytical methods, Ontario Hydroelectric Comm, Test transmission lines, *Galloping conductors, Flashover, Leakage current clearances, Dielectrics, Overvoltage.

Ontario Hydro's research program aimed at reducing the sizes of 230- and 500-kv multicircuit transmission towers is described. Congestion of rights-of-way in urban areas is an incentive to refine the design of high-voltage and extra-high-voltage transmission lines, the objectives being better land use and improved appearance of structures. Reductions of up to 50% may be possible in tower head dimensions by using new materials and techniques. Approaches taken include reviewing: (1) standard clearances required for construction, (2) operating security, and (3) maintenance. Research has provided designers with new opportunities for size reduction, using improved insulators, limiting switching surges, and controlling conductor galloping. Aesthetic criteria being studied and 2 design concepts are presented. (USBR)
W73-05059

TESTING OF THYRISTOR VALVES,
Allmanna Svenska Elektriska A.B., Ludvika.
A. Ekstrom, and L. E. Juhlin.
Paper 14-03, International Conference on Large High Tension Electrical Systems (CIGRE), Paris, France, Aug-Sept 1972. 13 p, 5 fig, 5 ref.

Descriptors: *High voltage, *Direct current, *Performance tests, Stress, Test procedures, Tests, Transmission (Electrical), Electrical equipment, Electrical studies.
Identifiers: *Thyristors, Transients, *Converters (Electrical), Switching surges, Overvoltage, Electrical faults, Sweden, *Valves (Electrical), Overcurrent.

Agreement is desirable in the rules and procedures for testing thyristor valves for HVDC. Specific tests are not described but a general base for future discussion is given. Therefore, only the most important voltage and current tests are considered. The stresses on thyristor valves at normal operation and during disturbances and faults are discussed. Methods and arrangements of feasible tests for checking the ability of thyristor valves to withstand these stresses are presented. Criteria for successful testing and proposed test values for special cases are given. Recommendations are that: (1) voltage tests be performed on complete valves, and (2) current tests be made only on modules of a valve, thus permitting special testing circuits to be small and inexpensive. Examples of feasible test values are given for different configurations of the converter station. (USBR)
W73-05060

DETERMINING TOLERABLE SHORT DURATION ELECTRIC SHOCK POTENTIALS FROM HEART VENTRICULAR FIBRILLATION THRESHOLD DATA,
State Electricity Commission of Victoria (Australia).
W. O'Keefe, N. G. Ross, and E. R. Trethewie.
Institution of Engineers, Australia, Electrical Engineers Transactions, Vol EE8, No 1, p 9-14, April 1972. 9 fig, 1 tab, 12 ref.

Descriptors: Electric current, *Safety, Hazards, Electric power, Alternating current, Transmission lines, Reviews, Laboratory tests.
Identifiers: *Electric shock, *Telecommunication systems, *Induced currents, *Induced voltage, *Electrical faults, Short circuits, *Shock (Physiology), *Electric potential, Injuries, Duration, Australia, Experimentation, Test results, Human behavior.

Where telecommunication circuits parallel high-voltage transmission lines, voltages of considerable magnitude can be induced in these circuits and in the metallic sheaths of the conductors during fault conditions on the transmission line. Data presented were studied to determine acceptable levels of voltage induced from faulted transmission lines into parallel telecommunication lines without risking death by ventricular fibrillation of personnel exposed to this voltage during work on the telecommunication lines. Since susceptibility of the human heart to the passage of electric current cannot be studied experimentally, deductions were made from observed behavior of experimental animals having cardiovascular systems similar to man. Published results of previous experiments on dogs and other animals were compared with data from tests on dogs at the University of Melbourne. These results led to a new approach for

determining threshold fibrillation currents for man. (USBR)
W73-05062

8D. Soil Mechanics

PIPING IN EARTH DAMS OF DISPERSIVE CLAY,
J. L. Sherard, R. S. Decker, and N. L. Ryker.
Proceedings, American Society of Civil Engineers Special Conference on Performance of Earth and Earth-supported Structures, Vol I, Part 1, Purdue Univ., Lafayette, Indiana, p 589-626, June 1972. 16 fig, 1 tab, 34 ref, 2 append.

Descriptors: *Earth dams, *Soil erosion, *Erosion, *Clays, *Dispersion, Soil science, Soil chemistry, Dam failure, Repairing, Sodium, Montmorillonite, Soil mechanics, Embankments, Laboratory tests, Erosion control, Clay minerals, Bibliographies, Oklahoma, Mississippi, Test procedures.
Identifiers: *Piping (Erosion), Pore water, Erosion strength, Sodium adsorption ratio, Dissolved slats, Echangeable sodium percentage, Progressive failures, Sinkholes.

Highly erodible (dispersive) clays cannot be differentiated by standard soil mechanics tests such as visual classification, particle size distribution, and Atterberg limits. Erodibility is known to be a problem because many well-constructed, low, homogeneous dams made of dispersive clays have either failed by piping or have been damaged by vertical erosion tunnels caused by rainfall. In the geographic areas studied, erodible clays can be identified using soil science tests that determine the amount of dissolved soil salts in pore water. Both laboratory dispersion tests and dissolved cation tests should be routinely performed in the design of an earth dam. For this investigation, piping was studied in 3 main groups of clay structures: (1) a flood control dike in Venezuela, (2) several low flood control dams in Oklahoma, and (3) several similar dams in Mississippi. Recent studies in Australia and Israel show that dam failure by dispersive piping is more likely to occur when the reservoir water has a low dissolved salt content, a condition that was present at failed dams in Oklahoma. Four of the Oklahoma dams susceptible to erosion were repaired successfully with a 12-in. layer of clay mixed with 2 to 3% of hydrated lime. The procedure for the SCS Laboratory Dispersion Test is included. (USBR)
W73-04572

EMBANKMENTS ON SOFT GROUND,
Norwegian Geotechnical Inst., Oslo.
L. Bjerrum.
Proceedings, American Society of Civil Engineers, Special Conference on Performance of Earth and Earth-Supported Structures, Vol II, Purdue Univ., Lafayette, Indiana, p 1-54, June 1972. 15 fig, 4 tab, 126 ref.

Descriptors: *Embankments, *Settlement (Structural), *Earth dams, Failure (Mechanics), Dam foundations, Clays, Foundation failure, Structural behavior, Slope stability, Bibliographies, Safety factors, Dam design, Pore pressure, Anisotropy, Foundations, On-site tests.
Identifiers: *Stability analysis, Vane shear tests, Preconsolidated soils, Sand drains, Compressible soils, Progressive failures, Undrained shear strength, Compressible foundation.

A review of papers on embankments constructed on soft clay concentrates on stability, settlement, and foundation improvement. From analysis of embankment failures, current design procedures are considered unsatisfactory because the uncrained shear strength measured by the in situ vane test generally is greater than the average value mobilized on the failure surface. A correction factor, a function of the clay plasticity, is given for in situ vane tests. Use of the correction factor permits recommending a reduced safety factor of 1.3 for the embankment design except in unusual cases. Embankment settlement can be more accurately predicted when the preconsolidation effects, which most soft clays exhibit, are considered. Principles for making such predictions are given. For improving soft clay foundations, the sand drain and preloading methods are considered theoretically and practically. Use of relief piles to reduce settlements and increase stability of embankments is reviewed briefly. (USBR)
W73-04574

HYDRAULIC FACTURING IN FIELD PERMEABILITY TESTING,
Norwegian Geotechnical Inst., Oslo.
L. Bjerrum.
Geotechnique, Vol 22, No 2, p 319-332, June 1972. 4 fig, 4 tab, 20 ref, 2 append.

Descriptors: *Permeability, On-site investigations, Water pressure, Laboratory tests, Piezometers, Pressure head, Bibliographies, Permeability coefficients, Clays, Fractures, Soil tests, Soil mechanics, Model tests, Stress, Cracks, On-site tests, Errors.
Identifiers: Hydraulic fracturing, Hydraulic pressure tests, Crack propagation, *Permeability tests, *Field permeability tests, In situ tests.

Field studies indicate that serious errors may result in estimating the permeability of fine-grained clay from in situ tests when excessive water pressures are used. Field tests using a piezometer in the impervious core of a dike indicated an apparent permeability increase factor of about 1,000 when the excess water pressure head was increased above 0.4 to 0.5 of the effective overburden pressure. Other field tests showed that hydraulic fracturing can occur at excess water pressures smaller than the effective overburden pressure. Although the disciplines of mining, grouting, and petroleum engineering are aware of hydraulic fracturing, it is not explicitly mentioned in the soil mechanics literature. Laboratory tests performed in a tank filled with soft silty clay also indicated that the correct permeability value to use is one calculated from low water pressures. Theoretical analysis of a piezometer inserted into clay indicates vertical cracks extending radially from the piezometer or circumferential horizontal cracks will form at ratios of excess water pressure to overburden pressure of from about 0.5 to 1.0. (USBR)
W73-04580

NUMERICAL ANALYSIS OF FREE SURFACE SEEPAGE PROBLEMS,
University Coll. of Swansea (Wales).
For primary bibliographic entry see Field 04A.
W73-04924

OBSERVED AND PREDICTED BEHAVIOUR OF TWO EMBANKMENTS ON CLAY,
Sydney Univ. (Australia).
H. G. Poulos.
Geotechnical Engineering, Vol 3, No 1, p 1-20, June 1972. 14 fig, 4 tab, 14 ref, append.

Descriptors: *Embankments, *Settlement (Structural), *Consolidation, Clays, Pore pressure, On-site tests, Finite element method, Instrumentation, Deformation, Anisotropy, Structural behavior, Soil mechanics, Structural analysis.
Identifiers: *Embankment subsidence, Pore water pressure, One-dimensional, Three-dimensional, Soil consolidation tests, Overconsolidation, Horizontal movement, Vertical displacements.

For 2 highly instrumented embankments constructed on deep deposits of clay, comparisons are made between predicted and measured settlement, rate of settlement, horizontal movement and excess pore pressure dissipation. Conclusions are: (1) Settlement predictions based on a 3-dimensional approach agree better with measured values than predictions based on a 1-dimensional theory. (2) Apparently, more satisfactory predictions are possible using the finite element method. Predictions in which the clay is assumed as a single uniform layer are unsatisfactory in instances where the soil deformation parameters vary markedly with depth. (3) Variations in soil parameters with depth and of anisotropy of the coefficient of consolidation, c sub v, must be considered to obtain reasonable time-settlement predictions, even if a 3-dimensional settlement analysis were used. Variations of c sub v with depth also must be considered to accurately predict the rate of excess pore pressure dissipation. (4) Agreement between observation and prediction appears less satisfactory for immediate settlement than for total settlement. (5) Predictions of horizontal movement are less satisfactory than those of settlement. (USBR)
W73-05068

8E. Rock Mechanics and Geology

SEISMIC EFFECTS OF RESERVOIRS,
W. V. Mickey.
Military Engineer, Vol 64, No 420, p 248-250, July-Aug 1972, 3 fig, 1 photo.

Descriptors: *Reservoirs, Earthquakes, Seismic studies, Geologic investigations, Faults (Geology), Reservoir sites, Dams, Water levels, On-site investigations, Project planning, Geologic structures, Correlation analysis, Seismology.
Identifiers: *Seismic investigations, Seismic stability, Reservoir filling, Glen Canyon Dam, San Luis Dam (CA), Falaming Gorge Dam (UT), Hoover Dam.

A joint panel of the National Academy of Sciences and the National Academy of Engineering reported that the earliest correlation between reservoir filling and earthquakes was identified with Marathon Lake, Greece, in 1929. The National Ocean Survey has been monitoring seismicity around dams and reservoirs in the US since 1938. Five sites in 4 states were selected for detailed study: Glen Canyon, Flaming Gorge, Lake Mead, San Luis, and Cedar Springs. Each is analyzed for seismic activity before and after reservoir filling, except Cedar Springs, which is a site only. Of the 5, only Lake Mead seismicity seems related to the reservoir, but the correlation is considered insignificant. A seismographic installation is recommended at proposed sites of large man-made reservoirs, with additional stations to be installed if seismic activity is noted. If quakes can be associated with surface faulting, networks should be established across the faults. (USBR)
W73-04570

A RELATIONSHIP BETWEEN JOINT ROUGHNESS AND JOINT SHEAR STRENGTH,
Norwegian Geotechnical Inst., Oslo.
N. R. Barton.
Paper 1-8, Rock Fracture, Proceedings, International Symposium on Rock Mechanics, Nancy, France, Oct 1971. 20 p, 17 fig, 2 tab, 27 ref.

Descriptors: *Joints (Geologic), *Shear strength, Rock mechanics, Model tests, Slope stability, Friction, Photogrammetry, Rock properties, Strength, Rock foundations, Compressive strength, Engineering geology, On-site investigations, On-site data collections.
Identifiers: Rock dilation, Stress ratio, Roughness, Dilation, Test results, Rock competency, Surface properties, Rock slope stability.

Tension fractures occurring because of different strengths of a weak, brittle model material are

taken to represent joint surfaces. Direct shear tests performed on these surfaces suggest that no appreciable peak-strength scale effect exists. Analysis of a large number of shear tests on model joints revealed that: (1) a linear relationship exists between the peak dilation angle and the peak stress ratio, and (2) a simple relationship exists between the peak dilation angle and the ratio of the normal stress to the compressive strength. A simple method, developed to statistically analyze roughness profiles recorded for joints with different degrees of roughness, involves the computation of inclination angles for asperities of different base lengths. These quantities are analogous to the change of peak dilation angles for different normal stresses. Practical application of this shearing analogy to slope stability problems is summarized, and a typical example enumerated. Photogrammetric recording of the roughness of joints exposed on rock faces, and a statistical analysis of the data, provides an estimate of the peak shear strength for any range of normal stress. (USBR)
W73-05065

FOUNDATION ANALYSIS OF AUBURN DAMSITE,
Bureau of Reclamation, Denver, Colo.
L. M. Christiansen, D. L. Misterek, and G. F. Bowles.
Paper 11-26, Rock Fracture, Proceedings, International Symposium on Rock Mechanics, Nancy, France, Oct 1971. 10 p, 2 fig, 2 ref.

Descriptors: *Foundation investigations, Rock foundations, Concrete dams, Joints (Geologic), On-site tests, Faults (Geologic), Finite element method, Geologic investigations, Arch dams, Dam foundations, Engineering geology, Structural geology, Rock mechanics, Foundations.
Identifiers: *Deformation modulus, In situ tests, In situ rocks, Rock tests, Dam stability, Auburn Dam (Ca), Foundation models, Joint-Shear Index.

Auburn Dam, in a wide V-shaped canyon, will be a thin double-curvature concrete arch structure 685 ft high and 4,000 ft long at the crest. The predominately amphibolite rock foundation mass was thoroughly investigated and is characterized by numerous joints, shears, talc seams, and faults. The in situ investigation included tests of direct shear, cylindrical and uniaxial jacking, plate gouge jacking, and stress relief. Laboratory investigations included standard property and direct shear tests. Individual foundation blocks and groups of blocks were analyzed for stability and compatibility of deformations under loadings from the dam and reservoir. The deformation moduli of the foundation were determined by combining test results and analytic procedures. Deformation moduli for local masses of rock were evaluated from in situ jacking tests. A Joint-Shear Index was developed to relate these moduli to laboratory core tests. The index was used to determine deformation moduli in local rock masses throughout the foundation. These moduli were further modified to account for discontinuous shears. The moduli from the local rock masses were combined with moduli from major faults and shears in a finite element solution to determine effective deformation moduli throughout the foundation. (USBR)
W73-05069

THE VALUES OF DEFORMATIONS IN ROCK FOUNDATIONS IN THE IN SITU SHEAR TESTS,
Ministerstvo Energetiki i Elektrifikatsii, Moscow (USSR).
S. A. Rosa.
Paper 11-25, Rock Fracture, Proceedings, International Symposium on Rock Mechanics, Nancy, France, Oct 1971. 9 p, 4 fig, 1 tab.

Descriptors: *Dam foundations, Deformation, Concrete dams, On-site data collection, Rock foundations, Fractures (Geologic), Foundation failure, Foundations, Foundation investigations, Geologic investigations, Joints (Geologic), Shear strength, Rock mechanics, On-site tests.
Identifiers: Rock-structure interaction, Foreign studies, Rock interfaces, USSR, Dam stability, Rock tests, Shear tests, In situ tests, Direct shear, In situ rock, Rock competency.

In calculating dam stability from in situ shear test results, the safety factor for the contact zone between concrete and rock should be at least 2 or 3, depending on the foundation test results. This conclusion was reached after observing numerous in situ shear tests of either concrete masses cast upon an uneven rock surface or rock blocks cut from the natural rock. The process of destruction of the contact zones in foundation tests can be divided into 3 deformation stages: In the first, the foudation rock buckles, but the concrete mass and foundation rock move as a unit at the contact zone. The second begins with cracks near the contact zone and ends with the cracks extending until the concrete block is completely separated from the rock foundation. In the third, displacement continues along the region that cracked during the second stage. Each of the 3 deformation stages can be related to the test load-movement curve. Test results from several dams indicated that on the everage the first and second deformation stages ended at 37 and 74%, respectively, of the maximum shear strength. The safety factor recommendations are made to keep the dam foundation in first-stage deformation where it moves with the rock as a unit. (USBR)
W73-05070

8F. Concrete

RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE.
American Concrete Inst., Detroit, Mich.

Journal of the American Concrete Institute, Proceedings, Vol 69, No 7, p 374-414, July 1972. 9 fig, 6 tab, 71 ref.

Descriptors: *Concrete construction, *Concretes, *Materials handling, *Mixing, Mass concrete, Bibliographies, Grouting, Aggregates, Construction joints, Curing, Paving, Inspection, Moisture content, Pozzolans, Quality control, Vibrations.
Identifiers: *Batching, *Placing, Ready-mix concrete, Cement content, Segregation, Transit mixers, Admixtures, Conveyors, Pumped concrete, Workability, Water-cement ratio.

Recommended methods and procedures for measuring, mixing, transporting, and placing concrete are presented. Best, rather than common, practices are described. Therecommendations apply principally to normal weight concrete, but many can be used for special concretes. Topics covered are: control, handling, and storage of materials, including pozzolans and admixtures; measurement of constituent materials; measuring equipment; batching tolerances; mixing, including ready-mixed concrete; retempering of mixes; mixing time; and mixers. Placement equipment, such as hoppers, buckets, buggies, belt conveyors, chutes, and drop pipes, are covered. Paving equipment is also discussed. Transporting concrete in revolving drum mixers, transporting centrally mixed concrete, prepleced aggregate concrete, tremic concrete and equipment, equipment and proportioning for pumping concrete, forms, cleanup and joint preparation, and finishing unformed surfaces are included. Illustrations of both good and poor practices portray the principles involved in achieving quality concrete in place. (USBR)
W73-04568

STRENGTH AND STIFFNESS OF LIGHTWEIGHT CONCRETE CORNERS,
Nottingham Univ. (England).
B. Mayfield, F-K Kong, and A. Bennison.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 7, p 420-427, July 1972. 5 fig, 2 tab, 14 ref.

Descriptors: *Lightweight concretes, *Reinforced concrete, Cracks, Ductility, Fly ash, Lightweight aggregates, Reinforcing steels, Strength, Joints (Connections), Concrete technology, Portland cements, Reinforcement.
Identifiers: *Flexural strength, *Stiffness, Stirrups, Ultimate strength.

Test results are presented for 54 reinforced lighweight concrete corners subjected to loads applied to open the corners. The effects of 28 types of reinforcement details on ultimate flexural strength, stiffness, and cracking were studied. Results indicate the necessity for using reinforcement capable of providing tensile resistance in the line from the inside reentrant angle to the outside of the corner. Using 2 sets of mutually perpendicular diagonal reinforcement is a promising method for reducing crack widths and achieving reasonable ductility. Diagonal reinforcement would resist the main bar forces which tend to cause failure by pushing away the outside portion of the corner. (USBR)
W73-04573

OPTIMAL DESIGN OF REINFORCED CONCRETE FRAMES,
Imperial Coll. of Science and Technology, London (England).
J. Munro, C. S. Krishnamoorthy, and C. W. Yu.
Structural Engineer, Vol 50, No 7, p 259-264, July 1972. 6, 5 fig, 1 tab, 25 ref.

Descriptors: *Reinforced concrete, *Linear programming, *Reinforcement, Algorithms, Analysis, Constraints, Ductility, Optimization, Compatibility, Equilibrium, Concrete technology.
Identifiers: *Optimum design, *Frames, Bending moments, Hinges, Local factors, Comparative studies.

A linear programming method of optimated design for reinforced concrete frames is presented. The method explicitly limits the plastic hinge angular discontinuities for a given loading scheme and member stiffness, yet satisfies serviceability constraints at working load. The aim of optimum design is to determine values of design bending moments at all critical sections to minimize the steel reinforcement required for the structure. A simplex algorithm is used to solve the problem. Examples illustrate the merits of the method; comparisons with ultimate strength design based on elastic solutions for factored loads show that significant savings can be realized. (USBR)
W73-05066

8I. Fisheries Engineering

EFFECT OF INTERTIDAL EXPOSURE ON SURVIVAL AND EMBRYONIC DEVELOPMENT OF PACIFIC HERRING SPAWN,
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-04682

TEMPERATURE CONTROL SYSTEM FOR RECIRCULATION FISH-HOLDING FACILITIES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. R. Scott.
Journal Fisheries Research Board of Canada, Vol 29, No 7, p 1082-1084, July 1972. 3 fig, 1 tab, 2 ref.

Descriptors: *Fish handling facilities, *Water temperature, *Fish, Rainbow trout, *Instrumentation, *Control systems, *Laboratory equipment, Electrical equipment, Temperature control, Gages, Valves, Construction materials, Reliability.
Identifiers: *Fish tanks, Heating devices, Cooling devices.

The temperature control system was used in a 420 gallon tank system over an 8-month period to rear rainbow trout under accurately controlled temperatures. The conditioning unit included heating, refrigeration, filtration, and aeration devices on a caster-mounted frame. The heating of water by an electric resistance element and the cooling by a water-cooled hermetic refrigeration compressor were performed in a stainless steel combination cooler-heater unit. The system was able to maintain temperatures below 2 C (0.8 C) which made it valuable for low-temperature investigations. Materials of construction were either plastic, fiberglass, epoxy-coated steel, or stainless steel. Substituting Ti for stainless steel in the cooler-heater makes the system suitable for use in freshwater or saltwater installations. This system proved compact, reliable, accurate, mobile, and operated at a temperature supportive for maintaining fish for research purposes. (Long-Battelle)
W73-04728

A COMPACT RECIRCULATION UNIT FOR THE REARING AND MAINTENANCE OF FISH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. R. Scott, and D. C. Gillespie.
Journal Fisheries Research Board of Canada, Vol 29, No 7, p 1071-1074, July 1972. 3 fig, 13 ref.

Descriptors: *Fish handling facilities, *Fish, Rainbow trout, *Water quality control, *Instrumentation, *Control systems, Water temperature, Growth rates, Laboratory equipment, Oxygen, Nitrogen compounds, Ammonia, Nitrates, Electrical equipment, Gages, Flowmeters.
Identifiers: *Fish tanks, Recirculation units.

A compact recirculation unit for rearing fish was evaluated over an 8-month period by determining the optimal number of rainbow trout that could be maintained in a healthy state. The recirculation unit consists of a 1600-l holding tank and water-conditioning components which controlled the water flow rate (56.7 l/min), temperature (10 C), oxygen, pH, ammonia nitrogen, and nitrate nitrogen. The unit, when optimally maintaining 75 kg of fish at a fixed rate of 2 percent body weight per day, produced an average fish weight gain of 8 percent per week. The compactness of the system's water-conditioning section and modest water requirements make the design valuable where space and water availability or cost are important factors. The only limiting components of the design were the filters and the poor efficiency of backwashing. The cost of this fresh-rearing recirculation unit is approximately $3000. (Long-Battelle)
W73-04729

DEVELOPMENT IN A RIVER OF ARTIFICIAL SALMON POOLS BY USE OF FLOW CONTRACTIONS (DEVELOPPEMENT EN RIVIERE DE FOSSES ARTIFICIELLES A SAUMON A L'AIDE DE CONTRACTIONS DE L'ECOULEMENT),
Cardeau, Inc., Quebec.
R. Nadeau, M. Frenette, and B. Michel.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 3, p 379-387, 1972 (release date). 12 fig, 5 ref.

Descriptors: *Fish passages, *River training, *Sediment control, *Channel morphology, *Migration, Salmon, Fisheries, Sedimentation, Fish migration, Channel improvement, Fish management, Canada.

Some rivers for salmon and trout migration have unstable beds and often natural pools are filled with sediments or completely destroyed following spring floods. A new and economical method is proposed to dig and stabilize artificial pools for salmon fishing. The method involves the construction of obstacles (rock-filled cribs) which cause local erosion and, at the same time, allow deposition of boulders of appropriate characteristics. (Knapp-USGS)
W73-04780

CRAYFISH AS POSSIBLE AGENTS OF DISSEMINATION OF FAIRY SHRIMP INTO TEMPORARY PONDS,
Loyola Univ., New Orleans, La. Dept. of Biological Science.
W. G. Moore, and B. F. Faust.
Ecology. Vol 53, No 2, p 314-316. 1972.
Identifiers: Artemia salina, *Crayfish, *Eggs, Faxonella clypeata, Ponds, *Shrimp, Streptocephalus seali.

Faxonella clypeata, coinhabitant with fairy shrimp in Louisiana temporary ponds, was fed ovigerous shrimp to test its role as a possible disseminator of anostracan eggs. Viable eggs of Artemia salina were recovered from crayfish feces. In tests utilizing Streptocephalus seali as food, intact eggs were recovered from the feces of 26% of the crayfish, of which 36% hatched.--Copyright 1972, Biological Abstracts, Inc.
W73-04892

OXIDATIVE CAPACITY OF THE LATERAL MUSCLE OF THE BREEDING FARM RAINBOW TROUT (SALMO GAIRDNERII RICHARDSON),
Jean Gras.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 274, No 1, p 70-72. 1972.
Identifiers: Breeding farms, Lateral muscle, *Oxidative capacity, *Rainbow trout, Salmo-gairdnerii, Trout.

Studies on the energetic metabolism of the muscular tissue in the trout focused on the rate of oxygen consumption (OC) and the value of glycolysis. Tests were conducted on specimens weighing 200 g. OC of muscular tissue of the breeding farm rainbow trout was studied by Warburg's manometric method. A kinetic study, in light of temperature, was carried out on tissue sections, in the presence or absence of exogenous substrates. The optimal value was reached at 25 degrees in the presence of succinate. In aerobiosis, and especially in anaerobiosis, glycolytic activity is slight and not influenced by the addition of glucose.--Copyright 1972, Biological Abstracts, Inc.
W73-05064

STUDIES ON THE TROUT OF GURUN-GOKPINAR (SALMO TRUTTA F. FARIO L.),
Ankara Univ. (Turkey). Faculty of Veterinary Medicine.
I. Baran.
Ankara Univ Vet Fak Derg, Vol 18, No 1, p 50-56, 1971, Illus.
Identifiers: Gurun-Gokpinar, Habits, Salmo-Trutta-Fario, Spawning, *Trout, *Turkey.

Food uptake and use by trout (S. trutta f. fario L.) in Gurun-Gokpinar (Turkey) during and after spawning was studied. During spawning food uptake is normal; however, the food supply is not sufficient. Trout eggs were found in the stomach and intestines of these fish during this time. After spawning, the fish are undernourished. Artificial feeding is needed during this time.--Copyright 1972, Biological Abstracts, Inc.
W73-05085

TROUT OF THE TEBERDINSKII GAME RESERVE AND PROSPECTS OF INCREASING IT'S RESERVES, (IN RUSSIAN),
L. P. Astanin, and M. I. Podgornyi.
Nauchn Tr Stavrop S-Kh Inst. 33, p 82-85. 1970.
Identifiers: *Fish establishment, Carp, *Trout, USSR.

The origin of Teberdinakii lake trout and the possibility of populating alpine lakes of the reserve with it are cosidered. In 1967 about 100 adult trout from the Khadzhib River were discharged into alpine Badukskie Lakes. Crucian carp was added to Lake Karakel to improve the nutrient base. The carp acclimatized itself well and was consumed by the trout.--Copyright 1972, Biological Abstracts, Inc.
W73-05126

STUDY OF THE NUTRITION OF TROUT FROM SOME LAKES AND RIVERS IN THE TEBERDINSK GAME RESERVE, (IN RUSSIAN),
K. V. Savel'eva.
Nauchn Tr Stavrop S-Kh Inst. 33, p 86-88. 1970.
Identifiers: *Fish diets, Lakes, Nutrition, Benthic organisms, Rivers, Stomach, Tendipeds, *Trout, USSR.

In 1967-68 the stomachs of 9 trout from Lake Kara-kel and 3 from Lake Tumanly-kel were studied. The stomacks of trout from Kara-kel were either empty or full. In Lake Tumanly-kel and the Khadzhib and Teberd Rivers the trout fed on benthic organisms. Food in the Khadzhib River included tendipeds.--Copyright 1972, Biological Abstracts, Inc.
W73-05127

EFFECT OF BREEDING CONDITIONS ON THE AMINO ACID COMPOSITION OF PROTEINS IN DOMESTIC CARP, AMUR WILD CARP AND THEIR HYBRIDS, (IN UKRANIAN),
V. Y. Vudmaska, V. M. Ivasyk, and I. M. Karpenko.
Dosl Zootekh L'viv Zootekh-Vet Inst. 1, p 169-177. 1970.
Identifiers: *Amino acids, *Fish diets, Breeding carp, Growth, Proteins.

Raising wild carp and hybrids on natural food and domesticated carp on synthetic food promoted an increase in the amount of irreplaceable amino acids in proteins. During the growth process of domesticated carp and also of wild carp raised on natural food, the content of these amino acids gradually increased, while in other groups of fish decreased.--Copyright 1972, Biological Abstracts, Inc.
W73-05129

NUTRITION, NUTRITIVE INTERRELATIONSHIPS OF FISH AND THE EFFECTIVENESS OF THEIR USE AS FOOD RESERVES IN NATURAL BODIES OF WATER OF BELORRUSIAN POLESSIE: I. NUTRITION OF BREAM IN RIVERS AND LAKES, (IN RUSSIAN),
V. P. Lyakhnovich, and T. I. Nekhaeva.
Vestn Beloruss Univ. 3, p 50-54. 1970.
Identifiers: *Fish diets, Belorussian polessie, *Bream, Fish, Interrelationships, Lakes, Nutrition, Plankton, Reserves, Rivers, USSR.

Bream under the age of 2 yr in the Goryn, Pripyat, Sozh and Dniepr Rivers and Lake Chervonnoe feed mainly on zooplankton. Older fish feed on benthos. The daily ration of bream computed by age and intensity of metabolism decreased with age from 15 to 3% of body weight calculated during the growing season. Computed for the entire year the daily ration changed within limits of 6.0-1.3% of body weight. For each unit of increase in body mass bream used from 14-18 units of consumed animals at a young age and from 20-32 units when older. The effectiveness of the use of energy

from assimilated food for growth (K2) varied within limits of 0.23-0.07. In Lake Chervonnoe the coefficient was somewhat higher than in rivers. The lowest coefficient was observed for bream in the Pripyat River.--Copyright 1972, Biological Abstracts, Inc.
W73-05130

THE DEVELOPMENT OF GRASS CARP CTENOPHARY-NGODON IDELLA (VAL.) IN FRASINET POND, (IN RUMANIAN),
V. Cure.
Bul Cercet Piscic. Vol 29, No 4, p 31-51. 1970. English summary.
Identifiers: *Carp, Ctenopharyngodon idella, Fish development, *Frasinet Pond (Romania), Romania, Fish diets.

Data are provided on trophic levels, stocking rate, plant diet and pond water conditions at Frasinet, Romania, during the period 1968-70.--Copyright 1972, Biological Abstracts, Inc.
W73-05131

CONTRIBUTIONS TO THE IMPROVEMENT OF THE TECHNIQUE OF INDUCED SPAWNING IN GRASS CARP (CTENOPHARYNGODON IDELLA (VAL.)), (IN RUMANIAN),
E. Popescu, S. Dragasanu, and R. Giurca.
Bul Cercet Piscic. Vol 29, No 4, p 20-30. 1970. English summary.
Identifiers: *Fish reproduction, Carp, Ctenopharyngodon idella, Fertility, Hypophyseal injection, *Spawning.

Based on natural conditions at the Caraorman Experimental Station (Danube Delta), the optimum period for hypophysial injection to induce spawning in C. idella is during the third week of June. Fertility data are given.--Copyright 1972, Biological Abstracts, Inc.
W73-05132

OOGENESIS OF PHYTOPHAGOUS FISH SPECIES (CTENOPHARYNGODON IDELLA, HYPOPHTHALMICHTHYS MOLITRIX AND ARISTICHTHYS NOBILIS), REARED IN CONTROLLED UNITS, IN ROMANIAN WATERS. (IN RUMANIAN),
Bucharest Univ. (Rumania). Faculty of Biology.
A. Nicolau, and I. Steopoe.
Bul Cercet Piscic. Vol 29, No 3, p 5-18. 1970. Illus. English summary.
Identifiers: *Fish establishment, Aristichthys nobilis, Ctenopharyngodon idella, Fish, Hypophthalmichthys molitrix, Oogenesis, *Phytophagous fish, Romania, Species.

The results obtained are described after 7 yr of research on the development of Ctenopharyngodon idella, Hypophthalmichthys molitrix and Aristichthys nobilis females, which were imported from China as fingerlings and reared at Nucet, fishculture station.--Copyright 1972, Biological Abstracts, Inc.
W73-05133

STURGEONS WORLD PRODUCTION AND STOCKS, (IN RUMANIAN),
G. Manea.
Bul Cercet Piscic. Vol 29, No 4, p 52-65. 1970. English summary.
Identifiers: *Fish conservation, Production, Stocks, *Sturgeons.

Measures are indicated to increase production of this highly valuable fish species. These include the protection and improvement of the natural breeding zones, fry protection, fishing restrictions and annual stocking of rivers.--Copyright 1972, Biological Abstracts, Inc.
W73-05134

CONTRIBUTIONS TO THE STUDY CONCERNING THE SPAWNING BIOLOGY AND THE GROWTH RATE OF THE DANUBE WHITE BREAM (BLICCA BJOERKNA BJOERKNA (L.)). (IN RUMANIAN),
Bucharest Univ. (Rumania). Faculty of Biology.
M. Papadopol, and E. Iancu.
Bul Cercet Piscic. Vol 29, No 3, p 77-91, 1970. Illus. English summary.
Identifiers: *Fish physiology, Blicca bjoerkna Bjoerkna, *White bream, Danube, Growth, Spawning.

White bream males and females become sexually mature at 2 yr and at a length of 80-100 mm. Development and maturation of the oocytes occur asynchronously. Growth rate both in length and weight is slow and accelerates in the year preceding sexual maturity and first spawning.--Copyright 1972, Biological Abstracts, Inc.
W73-05135

EXPERIMENT IN OBTAINING OFFSPRING FROM BIGHEAD AND SILVER CARP HYBRIDS AND RAISING OF SECOND GENERATION HYBRID UNDERYEARLINGS, (IN RUSSIAN),
N. V. Voropaev.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 2. p 98-102. 1969.
Identifiers: *Fish reproduction, Carp, *Fish hybrids, Offspring, Underyearlings.

Descendents of hybrids of the silver carp (SC) and bighead (B) and SC x B with the parent species were first obtained in 1968 in the fish hatchery of Hot Spring (Krasnodar Krai). The hybrid females were mature in the sixth year. Roe from the hybrids was of a high quality, fertility was higher than 85%. The number of abnormal embryos did not exceed 20%. The average survival rate to the larval stage was about 50%, from the larval to the juvenile stage it was about 40%. Hybrids of SC x B with the parent species hardly differed morphometrically from hybrids of the first and second generations. Hybrids of SC with SC x B were similar to silver carp except for the gill rakers.--Copyright 1972, Biological Abstracts, Inc.
W73-05136

ARTIFICIAL SPAWNING GROUNDS FOR LITHOPHILOUS FISH WITH EXAMPLES OF VIMBA AND SHEMAYA, (IN RUSSIAN),
V. S. Podgornov.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 2. p 253-257. 1969.
Identifiers: Artificial, Grounds, *Lithophilous fish, Shemaya, *Spawning, USSR, Vimba.

The vimba-shemaya hatchery on Solenoe Lake in the lower reaches of the Kuban River was used in 1964. The canals of the hatchery were artifiical breeding grounds of vimba and shemaya. The spawners from the stock pond shed eggs on the shingle of the canal floor--Copyright 1972, Biological Abstracts, Inc.
W73-05137

AUTOMATIC FOOD DISTRIBUTING DEVICE, (IN RUSSIAN),
V. P. Mikheev, and P. V. Mikheev.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoa. 2. p 258-261. 1969.
Identifiers: *Fish diets, *Equipment, Carp, Device.

A food distributing device was specially constructed for carp, which as fish without stomachs require food gradually over a large portion of the day. The device consists of a hopper with a worm conveyor, which is connected by a belt to a motor which works periodically from a command apparatus. For use in live fish tanks with carp, it gives 10-12 granules of food for 5-6 hr. An electric bell is included to attract the fish.--Copyright 1972, Biological Abstracts, Inc.
W73-05138

EFFECTIVENESS OF A VITAMIN B12 CONCENTRATE IN COMBINATION WITH NUTRIENT YEASTS FOR RAISING COMMERCIAL DOMESTIC CARP, (IN RUSSIAN),
M. R. Sedel'nikov.
Sb Nauchno-Issled Rab Vyses Nauchno-Issled Inst Prudovogo Rybn Khoz. 2. p 176-180. 1969.
Identifiers: *Fish diets, Fish farming, B-12, Carp, Commercial fish, Nutrients, *Vitamin, Yeasts.

Experiments done in the Savvinskii Fishery in 6 1-hr ponds tested the possibility of excluding or reducing animal products as food in order to enrich the diet of industrial carp with nutrient concentrations of vitamin B12. Better indices of chemical body composition were observed in fish administered a concentrate of the vitamin.--Copyright 1972, Biological Abstracts, Inc.
W73-05139

CULTIVATION OF GRASS CARP IN MONOCULTURE AND WITH DOMESTIC CARP IN SOUTHERN UKRAINE, (IN RUSSIAN),
I. M. Sherman.
Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12. p 78-80. 1971.
Identifiers: *Carp, *Fish farming, Fish stocking, Fish establishment, Ukraine, USSR.

Experiments were done in 1967-68 on the experimental base Tsyurupinskogo. One group of ponds was stocked with 4-5 day larval grass carp. The yield of juveniles from experimental ponds (raised with domestic carp) varied from 29.22 to 36.04%, while the yield of juveniles in the control (raised in monoculture) varied from 24.38 to 27.78%. In experiments in which grass carp fry were stocked and raised with domestic carp, the yield of juveniles was 77-84.13% and the yield of juveniles in the control was 82-82.45%. In all the experimental ponds the yield of juvenile domestic carp was sufficient and equalled 71.03-78.66%.--Copyright 1972, Biological Abstracts, Inc.
W73-05140

SPECIES COMPOSITION AND YIELD OF FISH JUVENILES IN THE MAN-MADE KANEVSKII RESERVOIR, (IN RUSSIAN),
A. N. Volkov.
Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12, p 99-103, 1971.
Identifiers: *Fish juveniles, *Kanevskii reservori, Reservoirs, *Species, USSR.

Data on the species composition, yield of juveniles and their dimensions in different years are given. A comparison of catches showed the relative numbers of juveniles in the Kremenchug Reservoir as a rule is lower than in the investigated area of the river, which is the upper continuation of the reservoir. One of the main measures to increase productivity is to increase the rate of juveniles saved from dying in large quantities in the many shrinking bodies of water.--Copyright 1972, Biological Abstracts, Inc.
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CONTENT OF FREE FORMS OF MICROELEMENTS MANGANESE, COPPER, ZINC AND MOLYBDENUM IN FISH BREEDING PONDS IN THE MOSCOW OBLAST (IN RUSSIAN),
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10C. Secondary Publication And Distribution

DETERGENTS,
Matz, Childs, and Associates, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W73-04700

MANGANESE IN LACUSTRINE ECOSYSTEMS: A REVIEW,
State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-04787

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 05G.
W73-05011

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Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 05F.
W73-04571

APPLICATIONS OF SYSTEMS ANALYSIS TECHNIQUES TO WATER RESOURCES,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W73-04623

FARM ANIMAL WASTE MANAGEMENT.
For primary bibliographic entry see Field 05G.
W73-05013

PRESENT ARCTIC GLACIATION,
Defence Research Establishment, Ottawa (Ontario).
For primary bibliographic entry see Field 02C.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

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1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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X730430